April 1947

Chemical Industries

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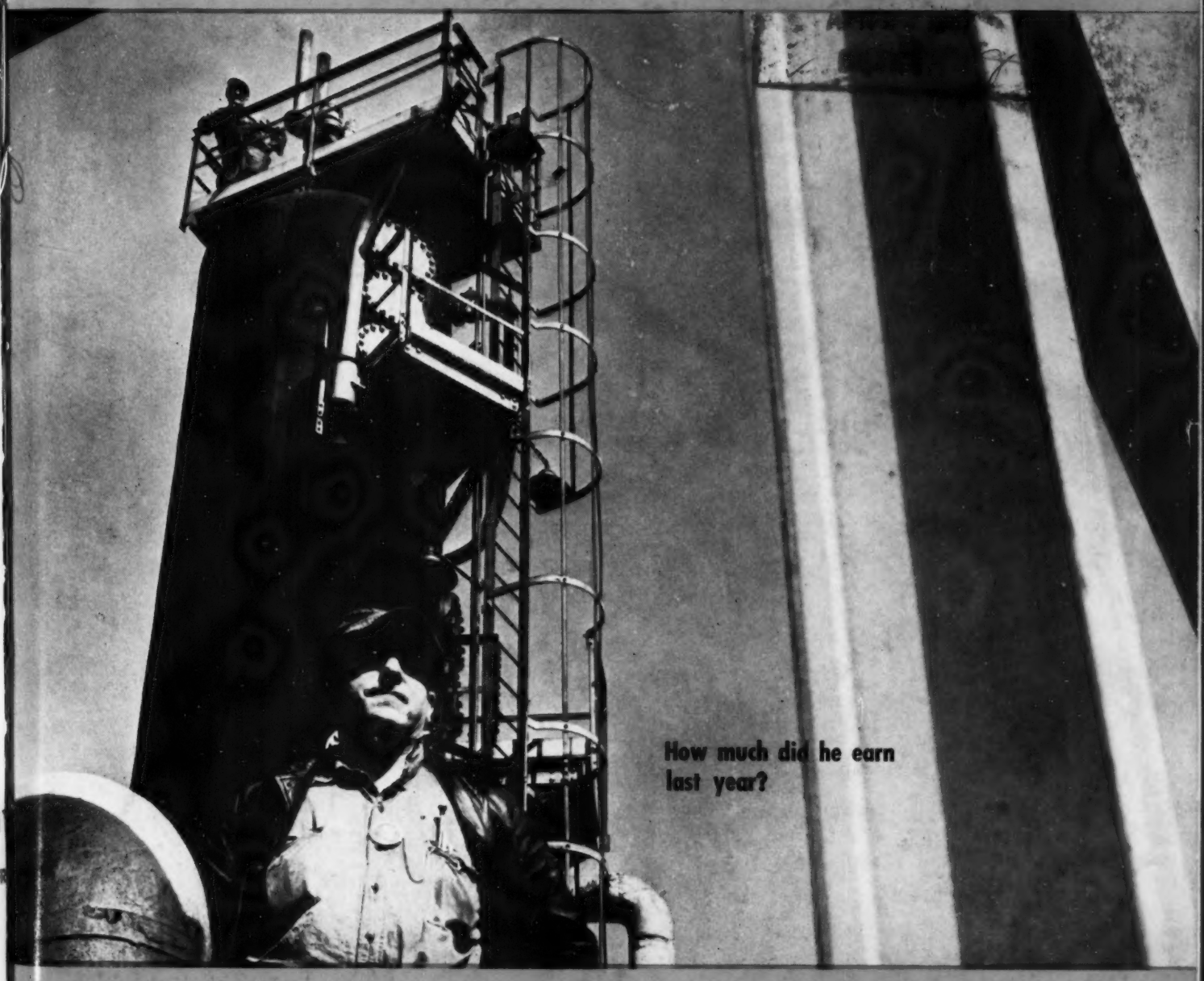

How much did he earn last year?

Wage Rates in the Chemical Industry p. 596

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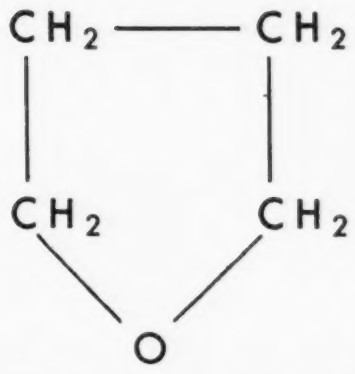
CELANESE ANNOUNCES TETRAHYDROFURANE



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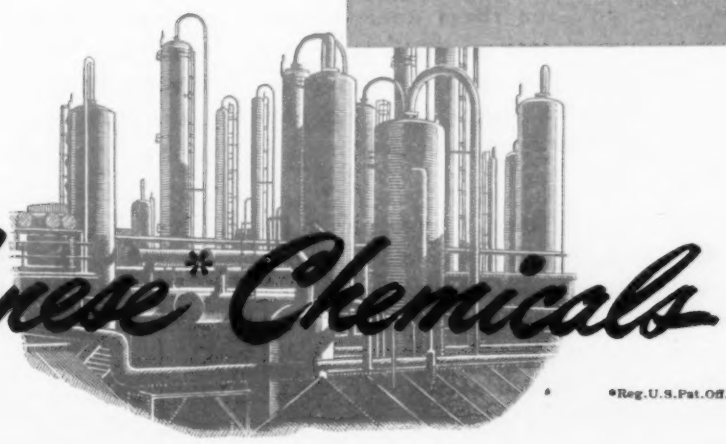

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THE CHEMICAL BUSINESS MAGAZINE

Chemical Industries

VOLUME 60
NUMBER 4

April 1947 Contents

DEPARTMENTS

NEWS OF THE MONTH

COVER:
Photo courtesy of Standard Oil Co. (N. J.)

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A MACLEAN-HUNTER publication, Horace T. Hunter, President

THE READER WRITES

Bosses Only

To the Editor of Chemical Industries:

I thoroughly enjoyed reading Ernest May's article entitled, "For Bosses Only." I think you are to be congratulated for obtaining and publishing an article of this nature. Mr. May has very ably stated the things which have been on the minds of many of us in the chemical industry for a number of years and I sincerely hope that they will be read and digested by those who are in a position to correct the abuses which he describes.

I also especially enjoyed Alec Jordan's editorial entitled, "Have You Ever Tried To Do Business With Your Company?"

A. C. HOPKINS, JR.
American Maize Products Co.
New York, N. Y.

To the Editor of Chemical Industries:

Ernest N. May's article "For Bosses Only" is certainly one of the best of its type that many of us have seen. The sincere, honest and straight-forward presentation of the three elements which give employees the "will to win" certainly should awaken supervisors and department heads who are afflicted with "Management Lethargitis." It is a shot in the mental mechanism, so to speak. Doubtlessly this shot would be exceedingly painful in some cases. However, the cure is obviously more desirable than the insidious disease — that of departmental stagnation which, in most instances, is attributable to rigor mortis of morale.

JACK C. HOLBROOK
Nashville, Tenn.

To the Editor of Chemical Industries:

I enjoyed reading "For Bosses Only." It has stirred a good deal of favorable comment both here and in Terre Haute.

DANIEL B. CURLL, JR.
Manager, Dixie Chemical Division
Commercial Solvents Corp.
New York, N. Y.

To the Editor of Chemical Industries:

I have read Ernie May's article in your January issue with a great deal of interest. I think Ernie has a lot of good ideas on this subject and it seemed to me that the article was an impressive one. I expect it was one of the most widely read articles in that particular issue and certainly it should have been.

HAROLD BRAYMAN
E. I. du Pont de Nemours & Co.
Wilmington, Del.

To the Editor of Chemical Industries:

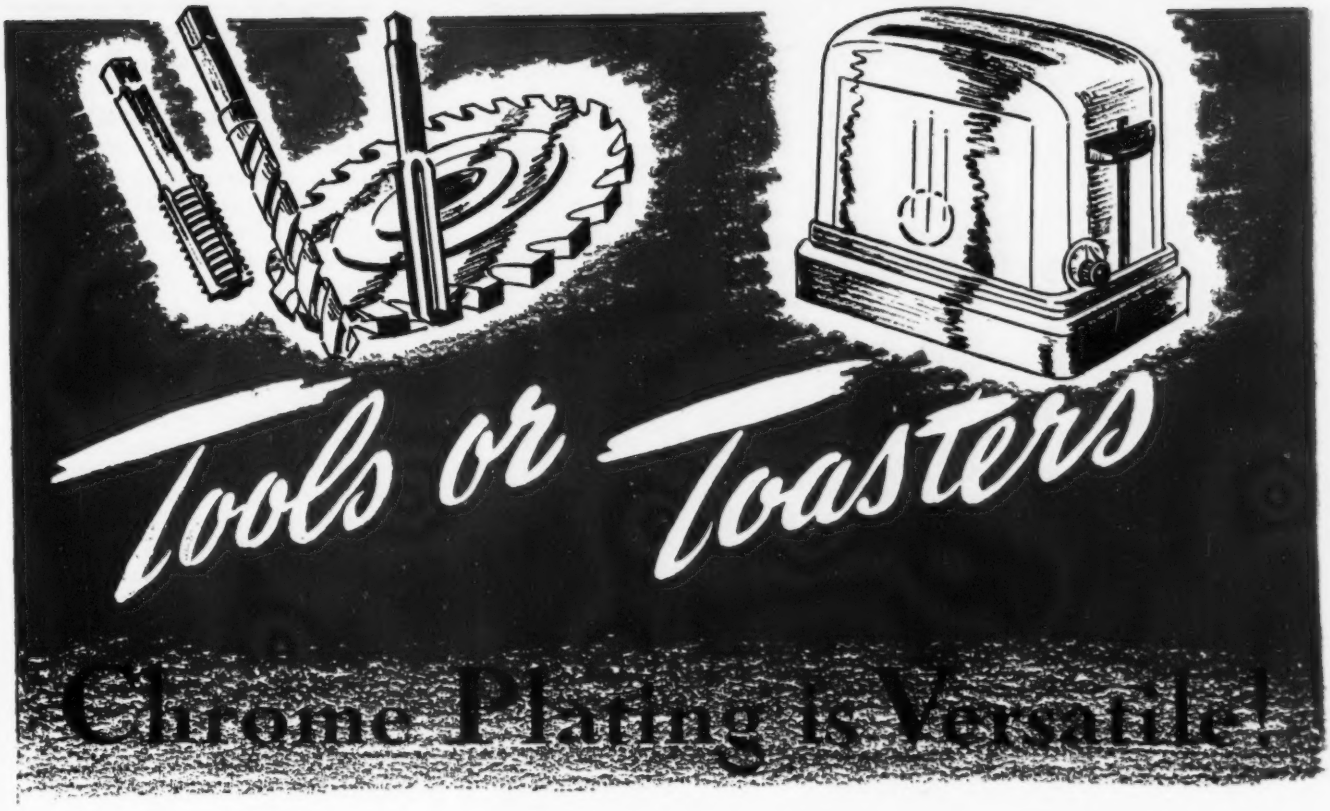
Mr. May's article, "For Bosses Only," which appeared in the January issue of your paper is an excellent, thought-provoking contribution to the difficult problem of desirable management-employee relationship. May I make a few comments?

Mr. May is in favor of compulsory retirement of top executives at a relatively early age, so as to instill hopes of promotion into the hearts of those in the lower ranks. It is a good argument, but there is another side to it, too. I know of one large company, for instance, which forces its executives to retire at the age of 60. The present incumbent moved into this position at the age of 48, which, I would say, is about the average age at which a man would be mature enough for the job. The man who preceded him was considerably older and sat at the executive desk for only six years. Is it not rather a short time of fruit gathering for a young man to look forward to? And, let us not forget the feelings of the man of 60, who is still in his full stride and probably at the height of his ability, when he is suddenly kicked into retirement and that "well earned rest" which he probably despises.

As to the stock participation plan—has Mr. May forgotten the year 1929? I happen to know a man in a subordinate position with a large firm which permitted all employees to buy its stock in 1928 at a few points under the market. This particular man, who was no longer a youngster, put all of his savings into the stock and was wiped out a year later. Even if the stock had only sunk a few dollars below the purchase price, do you think it would have "produced far more incentive" and "done more real good for the company," as Mr. May suggests?

Mr. May's points about vacations and those relating to behavior towards coworkers, high and low, are well taken and are worthy of general application. I also agree with him on his thought for increased professional recognition, but I would go a step farther than he does. He speaks mostly of what I would call inside recognition, such as awards by scientific societies, trips to society meetings, etc., all of which enhances a man's standing with the people of his own class or within his own concern. What chemists need, however, in addition to this, is increased recognition by the outside world.

After the close of the last war, many publications, like *Life Magazine, The Chicago Tribune,* and others, devoted full



HARD Chrome plate is distinctly different from the decorative Chrome plate that adds such a smooth bluish sheen to household appliances. Ornamental Chrome plate is soft because it is deposited thinly over a comparatively thick base of soft copper or nickel. Hard Chrome plate is composed of a much heavier deposit, made directly on a hard steel or cast iron surface.

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CHEMICAL COMMENTS

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Disinfectants Produced from Phenol Derivatives

Phenol derivatives are now being used in the manufacture of many disinfectants. These phenol products, produced by Dow, are known as Dowicides. They are noted for their high germ-killing powers which are largely retained in the presence of organic matter. Other important properties: excellent compatibility with cresols, pine oils, and soaps, and effectiveness under alkaline conditions. These qualities indicate the wide adaptability of Dowicides to the manufacture of bactericides and fungicides.

Propylene Glycol Used as Shortening Extender

The food industry is making increasing use of low-cost Dow propylene glycol because of its unusual properties as a solvent, humectant, preservative, and wetting agent. Through the wetting action of this highly purified material it has been found possible to extend the effectiveness of shortening in producing baked goods. Propylene Glycol aids in the dispersion of the shortening throughout the batch with a consequent saving of critical shortening not otherwise possible.

pages to pictures and descriptions of the correspondents who supplied their reading public with live news. If this was a fine gesture, and I think it was, why is it not worthy of imitation by chemical firms?

In my mind's eye I can see a magazine of national circulation print the pictures of a group of chemists—"These are the men who developed the formula for so and so during the War" or "These are the chemists who supply you with the life-saving this and that preparation."

Publicity of this kind would not only be a deserved recognition for those who are doing some of the world's most important work, but would be of incalculable benefit to the entire profession. For don't let us fool ourselves—while the man in the street hears a lot about chemistry, he still has only a foggy, and mostly cock-eyed idea, what a chemist is and what he does.

Otto Eisenschiml
1637 S. Kilbourn Ave.
Chicago, Ill.

Double Action Quaternary

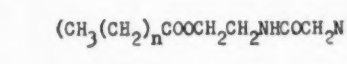
To the Editor of Chemical Industries:

Your January issue contains an excellent review on "Quaternary Ammonium Germicides", by Dr. C. A. Lawrence.

One statement could stand clarification however. On page 45 under the heading "Not Detergents" the author states: " . . . certain investigators today object to the use of the term 'cationic detergents' in describing surface active quaternary ammonium antiseptics."

It is a fact, as the author states, that surface modifying agents may have both wetting and detergent properties. I am also in agreement with the fact that these terms are not synonymous and a material may be a good wetting agent but a poor detergent. However, there is a product on the market today which does combine these two properties. This is Emulsept, manufactured by The Emulsol Corporation. The published literature contains references to its detergent action on woolens and on cleaning dirty shell eggs. It is now being used in an impregnated paper for washing the hands of physicians and dentists. Emulsept is also in use in food processing plants for washing the dirty fruits and vegetables as received from the farm.

It is interesting to speculate on the reason for Emulsept being so radically different from the other quaternaries in respect to detergency. We believe it is inherent in its chemical structure:



Most of the other products are simply hydrocarbon derivatives of ammonium chloride or bromide. In the above formula one group on the nitrogen contains a complex structure of "hydrophilic" oxygens and nitrogens. This makes Emulsept much more like the soaps and synthetic anionic detergents.

Herbert I. Bernstein
Director of Research
The Emulsol Corp.
Chicago 3, Ill.

A Serious Trade Problem

To the Editor of Chemical Industries:

I wish to stress again the gravity of the situation in connection with foreign credits. The United States is repeating a previous post-war error of over-extending its international charge account. Unless business men and the Government accept the fact that the United States has worked itself into a position of being a permanent creditor nation, the elaborate international economic machinery that is being set up will be of little use.

The only solution to this problem is for American business to follow the example established by Great Britain after the last World War by filling up this credit gap through extending direct or portfolio investments around the world. There is no doubt that United States business would be willing to extend its investments if it is assured diplomatic backing and precise definition of trading areas within state trading nations by such an organization as the proposed International Trade Organization.

One of the weaknesses of the proposed ITO charter, it that it fails to face this problem. Nationals that are members of the organization, particularly those with partially nationalized industry, should precisely define for other members those areas of their country that are free for foreign investment.

Each nation would, therefore, be divided into areas that are reserved for nationals alone, areas of industry that belong to the Government itself, and free areas in which foreign capital could extend its investments. In this way, American capital could flow freely abroad with the assurance that its investment would be protected from summary action by other governments.

Robert S. Aries, Research Associate
Polytechnic Institute of Brooklyn
Brooklyn 2, N. Y.

Why Not Symbols for Controls?

To the Editor of Chemical Industries:

I would appreciate your sending me a copy of "A. S. M. E. Standard Automatic Control Terminology" which recently appeared in your Plant Operations Notebook section.

It would be nice if they came out with some standard drawing symbols for this type of work.

Joseph D. Parent
Institute of Gas Technology
Chicago, Ill.

No.3

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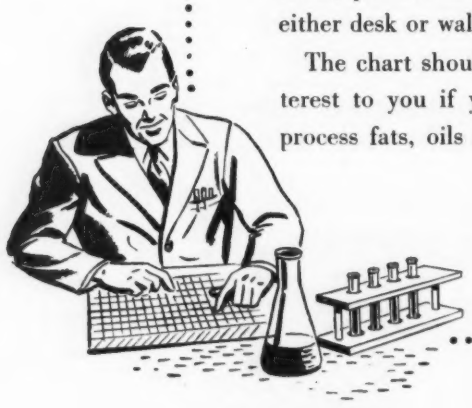

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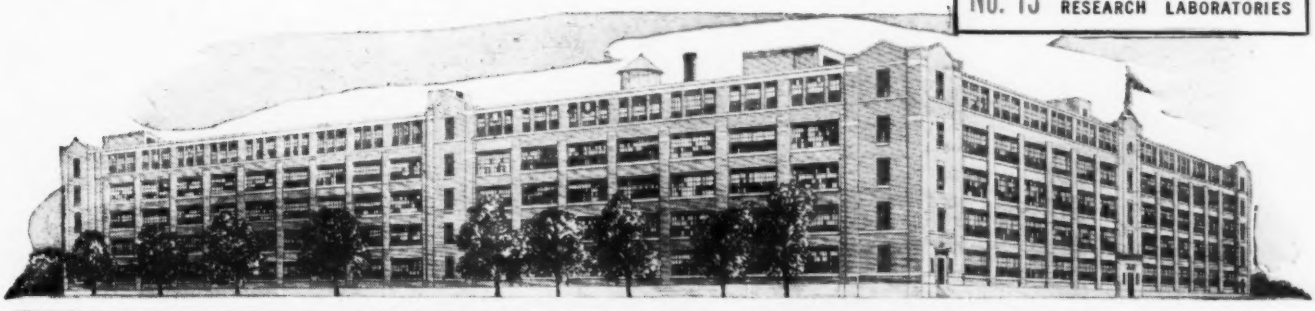

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nitroguanidine

$$H_2N\text{-}C(:NH)\text{-}NH\text{-}NO_2 \xrightarrow{+H_2} H_2N\text{-}C(:NH)\text{-}NH\text{-}NH_2$$
amino guanidine

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Ethanol (95%)	4.1 at 20°C 15.1 at 78°C
Methanol (95%)	4.7 at 20°C 15.6 at 64°C
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Adding to its large and varied list of surface active agents, Atlas now offers a group of *non-ionic, essentially neutral* detergents, providing exceptional performance and economy in use.

Atlas detergents are miscible with water in all proportions, relatively stable to acids and alkalies, and exceptionally non-irritating to the skin. Made in liquid form, they may be used with mild alkalies to form free-flowing powders. They are effective in soft water, hard water, or even sea water, giving excellent performance at usual laundry temperatures and remaining effective at lower ranges such as 100° to 120° F. They are especially useful as laundry detergents, being particularly effective on cottons . . . are readily adaptable for such formulae as paint and household cleaners, and dry cleaning soaps . . . and are helpful in the special laundering of fine fabrics and woolens.

The Atlas technical staff with its wide experience in emulsifiers, wetting agents and other surface active agents, is at your service. Write for trial samples of Tween 80, G-1226 and G-7596-J Atlas detergents. Detailed information is sent with all samples to aid you in choosing the detergent best suited to your requirements.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

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U.S.I. CHEMICAL NEWS

April ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1947

Chemical Russian 'Made Easy' at Last

If the Russian language has proved a stumbling block to your understanding of the latest chemical developments in the Soviet Union, a current series of articles designed to help you teach yourself chemical Russian may be just the thing you're looking for. Translation is far easier than you think, according to the author. For example, he states that in naming organic compounds, the Russians make very extensive use of terms having English cognates. As a consequence, English-speaking chemists need do little more than learn the Russian alphabet in order to understand Russian organic chemical nomenclature.

Prevents Foaming of Many Hydrocarbon Oils

Foaming can be suppressed in hydrocarbon oils and oil compositions containing them according to the claims made in a recent patent. The process is described as producing a liquid organo-germanium oxide condensation product substantially insoluble in the oil and having a low interfacial tension toward the oil. This is said to decrease the normal foaming tendency of the oil without altering any of its desirable properties.

THE MONTH IN FUELS

A report indicates that a colloidal mixture of coal and fuel oil gives better combustion than either ingredient alone . . . "Smokeless fuel" is marketed . . . A standard unit for testing fuel oils is developed . . . Government sources urge the use of lignite for synthesizing oil . . . A new "combustion control" is claimed to give more economical starting of oil furnaces . . . A microspherical cracking catalyst is invented which is said to resist attrition . . . U. S. crude reserves reach all-time peak . . . A new motor fuel additive is said to inhibit gummy deposits, remove deposits already formed, and lubricate working parts in the combustion zone . . . The Bureau of Mines requests an additional thirty million dollars for synthetic liquid fuel research . . . Two commercial plants are under construction to place the Fischer-Tropsch process in operation.

'Chemische Berichte' Is Published Again

The "Berichte der Deutschen Chemischen Gesellschaft," one of the most prominent German chemical journals, which ceased publication after 1944, has now been revived under the name "Chemische Berichte." Copies of the journal are available beginning with the January 1947 issue.

Map of Mildew Areas

A map showing the areas of the United States that are vulnerable to mildew and rot is now available. The map is expected to be of special interest to textile, paper, and other manufacturers whose products are vulnerable to attacks of this type.

New Uses for Ethanol Found in Photography, Medicine, Food

Employed in Rapid Photographic Drying, Extraction of Rutin, Treatment of Diseased Cows, Preparation of Soy Bean Oils

Ethyl alcohol, familiar stand-by of industry, and raw material for many final products, including anti-knock agents, synthetic rubbers, and organic acids, is now an essential component of many new industrial and scientific methods. Uses for ethanol now include the rapid drying of photographic materials, the treatment of anaplasmosis in cattle, the preparation of rutin from buckwheat, and the extraction of soy bean oils.

RAPID DRYING highlights recent progress in photography made possible by use of ethanol.

New Medicinal Uses

Two new processes have been developed recently to extract the drug, rutin, from dried buckwheat-leaf meal. In one process the extractant is alcohol. In the other, it is boiling water, but alcohol is used in the purification phase. Evidence of the therapeutic value of rutin for reducing the tendency of the capillary blood vessels to rupture, with consequent hemorrhage, in some persons having high blood pressure, continue to accumulate, a recent government report states.

(*Continued on next page*)

Urethan Treats Dog's Leukemia — Derivative Seen as Aid to Surgery

Spectacular improvement in a dog suffering from leukemia as a result of urethan therapy, and the use of a urethan derivative to combat after-effects of surgery are described in two papers published recently.

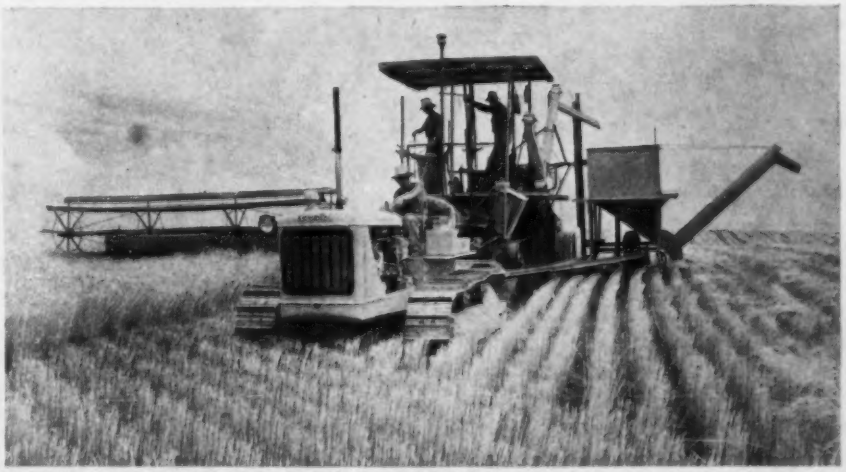
The treatment for leukemia consisted of daily doses of urethan in syrup. At the time the treatment was started, the dog was not expected to live more than a day. Within 24 hours, however, after the commencement of urethan therapy, the dog is said to have become energetic and ravenously hungry. The number of leukocytes in the blood decreased, and the dog's weight returned to normal, it is claimed. Improvement lasted for nearly two months but was not retained, the paper states. Leukemia, known as "cancer of the blood," is an abnormal proliferation of white corpuscles.

Restores Gastric Peristalsis

Following operations on the vagus nerve to relieve pain of gastric ulcers, a beta-methylcholine derivative of urethan is claimed to have restored gastric peristalsis and motility. This form of surgery sometimes causes loss of muscle tone of the stomach, resulting in gastric distress, loss of appetite, nausea, vomiting and malnutrition.

Need Research Help?

If you need outside help in working out your current industrial headache, a new booklet may help you. It's an 80-page government directory listing research laboratories and technical facilities available to industry in New York State. There's no charge.



MAKING A NEW DRUG — From this harvest of buckwheat, via an alcohol extraction process, will come the new drug, rutin, to combat high blood pressure.

April ★ **U.S.I. CHEMICAL NEWS** ★ 1947

New Alcohol Uses

(Continued from page one)

The serious cattle disease, anaplasmosis, caused by a micro parasite which lives in and destroys the red blood cells, is now said to be treated successfully by a dye metal complex whose active ingredients consist of alcohol, crystal violet, and lactic acid.

Another new pharmaceutical — a combination of alcohol, dextrose, and the vitamin B complex — is claimed to be a substitute for morphine. It is applied intravenously to give relief from post-operative pains. Using intravenous alcohol is claimed to increase the respiratory rate and give protection against pulmonary complications. The action of this drug is said to be slower than morphine, but it is reported to last longer and to be non-habit forming.

Aids in Photography

Outstanding aid to photography is the use of ethanol to accelerate the drying of materials. A recent study has shown that the acceleration of drying by ethyl alcohol is due to the penetration of the alcohol into the gelatin layer and replacement of part of the water to nearly equilibrium conditions.

Ethanol is also used in the preparation of emulsions of low setting point and high wetting power, particularly suitable for application to irregular surfaces by means of a spray gun. A typical gelatin-silver emulsion of this type contains ethyl alcohol plus a solution of a long-chain sodium alkyl sulfate.

It has also been found, according to a recent patent, that the adhesion of photographic gelatin layers to plastics such as polystyrene is improved by using one or more substrata containing maleic acid. The maleic acid substrata is prepared by dissolving the acid in an acetone-ethanol mixture containing dispersed gelatin.

Extracts Soybean Oil

Industrial application of a new continuous alcohol extraction process of soy bean oils is expected to lead to lower cost of oil extraction, higher quality of oil, and a more palatable soybean meal suitable for making soybean flour or for use in various food products. In this process, the alcohol is recovered for reuse by chilling rather than by the more familiar method of distilling the alcoholic solution of oil.

Ethanol is also employed in the manufacture of insecticidal compounds of the type $HO\text{-}CH_2\text{-}CH_2\text{-}NHR$ where R is an alkyl or alkenyl radical containing at least six carbon atoms according to a recent patent. The N-octyl and N-dodecyl compounds are reported to be toxic to houseflies in a five per cent concentration of kerosene. The compounds may be used in solution, in water emulsion, or in dust with inert carriers such as talc.

Do *You* Know How It Works?

What makes that toy bird keep dipping his beak into a glass of water without any mechanical aid is a secret no longer. The answer is acetone.

As described in a recently-issued patent, the bird is actually a hermetically-sealed, balanced still. Here's how it works: At room temperature, vaporization of acetone in a bulb concealed in the tail of the bird, causes the liquid acetone to rise in a tube which projects into that bulb and connects with another bulb in the head. The liquid rising to the head, overbalances the bird and dips its bill into the water. When the bill is in the water, absorption and evaporation of water on the outside fuzzy surface, condenses the vapor in the head. The excess liquid then flows to the tail, making it heavier and raising the beak.

TECHNICAL DEVELOPMENTS

Further information on these items may be obtained by writing to U.S.I.

A 100% vulcanized starch can be cooked in boiling water or 5% alkali without increasing its granule diameter more than 5 microns, the manufacturer states. **(No. 179)**

USI

A heat-resisting synthetic fiber can be heated to 200 degrees C. without appreciable discoloration, according to the manufacturer's claims. **(No.180)**

USI

To prevent "creeping" precipitates, an anti-creep fluid is now being marketed. A few drops of this fluid in the wash solution is said to prevent the "creep" of precipitates on the filter paper and facilitate the transfer of the insolubles from the precipitation vessel. **(No. 181)**

USI

A non-hygroscopic soda lime, reported to be capable of absorbing 25-40% of its own weight of dry CO_2 is said to have uniform absorption throughout its whole active life. **(No. 182)**

USI

To crease thermoplastics flawlessly, a new machine is said to make possible thermal creasing of sheet plastics in either rubber or metal die and elimination of under-or-overcreasing. **(No. 183)**

USI

High-temperature, high-strength porcelains, said to have exceptional mechanical and dielectric strength up to 2,000 deg. F., have been developed. They are said to be particularly useful in aviation spark plugs and radar transformers. **(No. 184)**

USI

Wax- and oil-soluble dyestuffs, claimed to be unaffected by high temperatures required to melt certain waxes, are reported to be equally soluble in vegetable and mineral oils and also produce clear shades in resins and plastics. **(No. 185)**

USI

To prevent ultra-violet burns, a new plastic, said to filter out harmful radiation in sunlight, is offered for use in protective sunglasses, canopies, aircraft enclosures, and similar items. **(No. 186)**

USI

Commercial Grignard reagents may now be obtained in quantities of 500 grams of solution to drum lots, the manufacturer states. Formerly, each manufacturer had to manufacture his own Grignard reagents. **(No. 187)**

USI

To insulate high-temperature equipment and piping, a new material is offered which can also be used as a filtration medium where chemical resistance and inertness is required, according to the makers. **(No. 188)**

USI

Tight-shrinking bottle caps which are alleged to shrink in place to form tight fit are now available for use as sealing caps, as caps to apply over cork or glass stoppers, and as sleeves to seal conventional closures. They are described as being resistant to acid, alkali, and moisture. **(No. 189)**

For Your Fine Chemical Needs

B&A MERCURIC NITRATE

Reagent

Made to Baker & Adamson's own strict Reagent specifications, this white crystalline product assays 99% min. $Hg(NO_3)_2 \cdot H_2O$. Low in iron and chloride, it offers a purity suitable for many exacting uses such as the preparation of mercuric nitrate ointments for treating skin disorders. Other applications for this material include: carroting of furs for felting into hats; manufacture of mercury fulminate used in percussion caps and detonators; ingredient of baths for producing blue-black or gray-black colors on iron and steel; manufacture of organic mercurials used for closed-system papermaking plants, for protecting soil, seeds, and wood against certain fungi and insects, and for prevention of mold formation in paints and varnishes; preparation of mercuric acetate, etc.

Rely on General Chemical's

B&A BARIUM FLUORIDE

Reagent & Technical

A superior product, low in impurities, this B&A Quality chemical assays 99% min. BaF_2 in the Reagent grade and 98% min. in the Technical. Thus, Industry has two forms of exceptionally high purity to consider for the many applications of this product. Some of these include: flux in preparation of high-copper alloys; flux or opacifier in manufacture of enamels, glass and ceramics; manufacture of heat-treating salts; as an insecticide; as an agent for insulating electrodes used in electronic cathode ray tubes; in the manufacture of arc lamp electrodes, etc.

Baker & Adamson Division

B&A ACETYL CHLORIDE

Reagent & Technical

Both grades of this B&A purity product have the same high assay of 95% min. CH_3COCl. Many users requiring quality acetyl chloride in quantity find the Technical grade meets their needs. Among the applications for this B&A Fine Chemical are: an intermediate in the manufacture of organic pharmaceuticals, i.e. heroin (diacetylmorphine); acetylating agent in the synthesis of organic chemicals such as acetophenone, acetoresorcinol, and acetamide; manufacture of acetyl peroxide.

★

This is the fourth in a series of advertisements reviewing the B&A Fine Chemicals *commercially available* to American Industry today from the Baker & Adamson Division of General Chemical Company. Scores of such purity products await your investigation. To learn more about these or other B&A Fine Chemicals that meet your requirements, write or phone nearest B&A Sales and Technical Service Office.

GENERAL CHEMICAL COMPANY

BAKER & ADAMSON DIVISION

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Albany* • Atlanta • Baltimore • Birmingham* • Boston* • Bridgeport Buffalo* • Charlotte* • Chicago* • Cleveland* • Denver* • Detroit* • Houston • Kansas City Los Angeles* • Minneapolis • New York* • Philadelphia* • Pittsburgh* • Providence* • St. Louis* San Francisco* • Seattle • Wenatchee (Wash.) • Yakima (Wash.)
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In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver*

SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

*Complete stocks carried here.

FINE CHEMICALS
BAKER & ADAMSON B&A QUALITY
STANDARD OF PURITY
FOR AMERICAN INDUSTRY

New
Better
Greater Economy

CALCIUM STEARATE

Calcium Stearate Impalpable Powder Grade A

* BULK—*6 lbs. per cubic foot*

† FINENESS—*99½% through 325 mesh*

¶ HEAVY METALS—*Meets food standards*

¶ WATER SOLUBLE SALTS—*Less than 0.1% as chloride*

* When packed, 11.5 lbs. per cubic foot. Easily fluffed back to 6 lbs. per cubic foot.

† This means that all aggregates will pass the finest commercially used screen. Actually the ultimate particles are of the order of 3 to 5 microns in size. This insures smoothness and freedom from grit.

¶ This means that the excellent properties of the new material can be applied to food and pharmaceutical uses.

¶ This means that, with the use of this lubricant, electrical parts can be molded without affecting electrical resistance. It also means that emulsions are easily made and permanent when this compound is used in them.

A refinement of manufacturing techniques—backed by 80 years of experience—gives industry a new and better *Calcium Stearate Impalpable Powder Grade A,* with enhanced use values at greater economy than ever before. Other stearates are also improved correspondingly. For further information ask your nearest Mallinckrodt office.

MALLINCKRODT CHEMICAL WORKS

FINE CHEMICALS Mallinckrodt SINCE 1867

80 Years of Service *to Chemical Users*

Mallinckrodt St., St. Louis 7, Mo. • 72 Gold St., New York 8, N. Y.

CHICAGO • PHILADELPHIA • LOS ANGELES • MONTREAL

UNIFORM • DEPENDABLE • PURITY

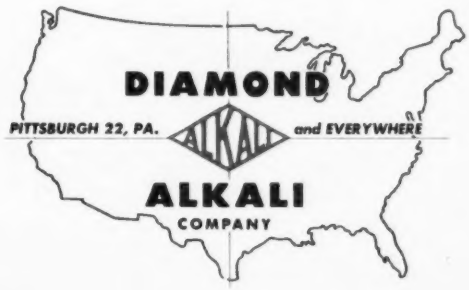
From Enormous Stocks of Raw Materials

Diamond Products

are produced for every Industrial Need

Millions of gallons of water . . . thousands of tons of coal, limestone and salt constantly stream into *Diamond's* plants, and are continually being processed into alkalies and chemicals to meet industry's ever-increasing demands.

Diamond's plants and facilities are constantly being expanded and improved to handle even greater quantities of these raw materials, so that we may continue to merit and enjoy the confidence placed in us, and to supply industry's needs for the highest quality Diamond Products.



- SODA ASH
- CAUSTIC SODA
- BICARBONATE OF SODA
- SILICATE OF SODA
- LIQUID CHLORINE
- CARBON TETRACHLORIDE
- CALCIUM CARBONATES
- SPECIAL ALKALIES

TOTAQUINE MERCK

an official U.S.P. Antimalarial

All Government controls covering the use and sale of Totaquine, Cinchonidine, and Cinchonine have been cancelled.

Totaquine Merck U.S.P. XII is a greatly improved product—a white to slightly yellow fine powder, practically free from Quinoidine, and fully meeting all specifications. Totaquine Merck is an effective and low-cost antimalarial.

Ample stocks of Totaquine U.S.P., Cinchonidine Alkaloid, and Cinchonine Alkaloid are available for prompt shipment upon receipt of your order.

Information on the compounding of Totaquine is available on request.

Write to Technical Sales Service, Merck & Co., Inc., Rahway, New Jersey

TOTAQUINE MERCK

MERCK & Co., Inc. RAHWAY, N. J.

Manufacturing Chemists

New York, N. Y. • Philadelphia, Pa. • St. Louis, Mo. • Elkton, Va. • Chicago, Ill. • Los Angeles, Calif.

In Canada: Merck & Co., Ltd., Montreal • Toronto • Valleyfield

Chemicals

FOR THE PROCESS INDUSTRIES

THERE'S no substitute for the word experience. It's well to bear in mind that Turner has been supplying chemicals to the process industries for over 75 years. Call on us the next time you're in the market and you'll be quick to say that Turner is *"long on quality and strong on service."*

TURNER CHEMICALS

- Ammonium Sulphate (Refined)
- Ammonium Persulphate
- Borax
- Caustic Soda (Flake & Solid)
- Caustic Potash
- Sodium Chloride
- Carbonate of Potash
- Potassium Persulphate
- Copper Carbonate
- Bromides (Sodium—Potassium Ammonium)
- Phosphorus Oxychloride
- Phosphorus Trichloride
- Stearates (Aluminum—Calcium —Zinc)

JOSEPH TURNER & CO

83 Exchange Place, Providence, R. I. **RIDGEFIELD, NEW JERSEY** 435 N. Michigan Ave., Chicago 11, Ill.

FIVE pounds of glass

ONE pound of soda ash

That's the amount of Soda Ash in glass —about 20 per cent! The result is a tremendous demand for Wyandotte Soda Ash . . . as the progressive glass industry continues to develop new uses for its product.

Plate glass has increasing use in construction. From glass are made containers . . . draperies and awnings . . . insulation and home fixtures. And Wyandotte Soda Ash is used in many industrial chemicals . . . in the making of pulp and paper . . . soap products . . . non-ferrous metals.

All the new calls for Wyandotte Soda Ash — coming on top of increasingly heavy demands for old uses — have overtaxed our production facilities. And before we are able to put out *more* Soda Ash we must have enormous additional facilities—including a lime kiln, a 9-ton casting and a 310-ton, 15-story distiller—all "tailor" made and requiring tens of thousands of man-hours to produce and install.

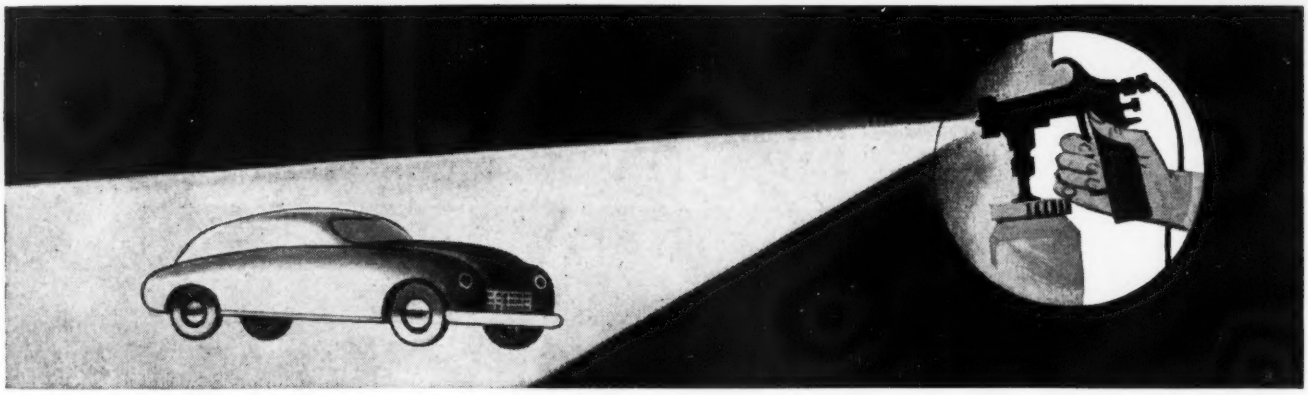
We are doing everything possible to increase production of Wyandotte Soda Ash—while fairly allocating the available supply to present Wyandotte customers.

WYANDOTTE CHEMICALS CORPORATION

WYANDOTTE, MICHIGAN • OFFICES IN PRINCIPAL CITIES

Soda Ash • Caustic Soda • Bicarbonate of Soda • Calcium Carbonate • Calcium Chloride • Chlorine Hydrogen • Sodium Zincates • Aromatic Intermediates • Dry Ice • Other Organic and Inorganic Chemicals

Wyandotte
REG. U. S. PAT. OFF.



P-354 BECKAMINE

assures better baked finishes in faster time

When you add P-354 Beckamine to your automobile or refrigerator undercoats and enamels, several things happen—*all good.* Baking time and temperatures are reduced . . . hardness is increased, as is resistance to heat, soap, water and fatty acids . . . and both color and color retention improve. And that's not all! Initial gloss, gloss retention and abrasion resistance rate "excellent", too, and use of this superior urea-formaldehyde resin gives you whites that are "really white." P-354 Beckamine produces fine results in combination with any alkyds, but it is especially effective with RCI Beckosols. For formulating suggestions write direct to the Sales Department at Detroit.

"Supplying—not competing with—the makers of better surface coatings."

REICHHOLD CHEMICALS, INC.

General Offices and Main Plant, Detroit 20, Michigan

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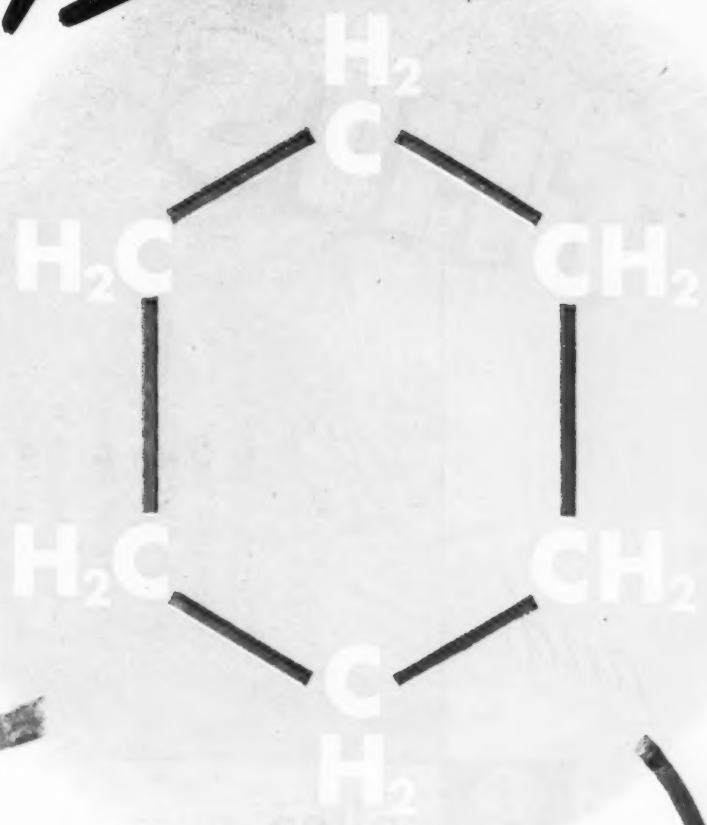
Liverpool, England • Paris, France • Sydney, Australia • Zurich, Switzerland • Milan, Italy • Rio de Janeiro, Brazil

SYNTHETIC RESINS • CHEMICAL COLORS • PHENOLIC PLASTICS • INDUSTRIAL CHEMICALS

FROM SHELL CHEMICAL

CYCLOHEXANE



For Immediate Shipment

in drum or tank car quantities

TYPICAL PHYSICAL PROPERTIES

	PURE CYCLOHEXANE	SHELL CYCLOHEXANE
Spec. Grav. 20/20°C	**0.780**	**0.778**
B.P. (760 mm)	**80.74°C**	**80.2-81.5°C**
Refr. Index 20/D	**1.4262**	**1.425**
Freezing point	**6.56°C**	**1.5°C**

The purity of this product, its low sulphur content, and the small amount of paraffinic, aromatic and other naphthenic impurities, suggest its use as a starting material for the manufacture of other intermediates and organic chemicals.

Other Shell Chemical products include: Isopropyl Alcohol, Methyl Isobutyl Carbinol, Mesityl Oxide, Secondary Butyl Alcohol and Glycerol Dichlorohydrin.

For quotations and a sample, write our nearest district office.

SHELL CHEMICAL CORPORATION

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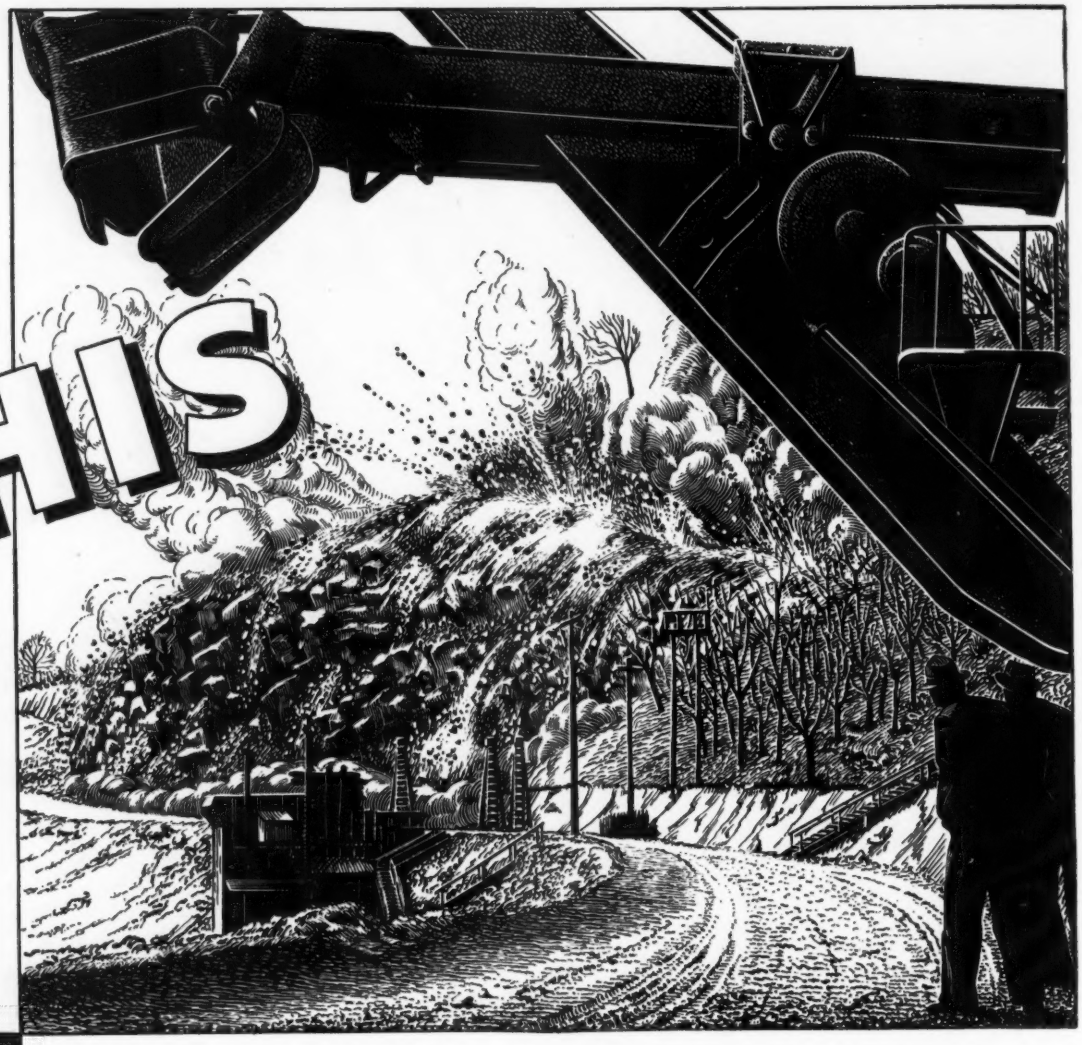

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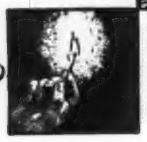
THIS 

often owe their "oomph" to PENNSALT

POTASSIUM CHLORATE

Whether you manufacture mining explosives or matches, pyrotechnics or paper . . . your product is no better than the ingredients of which it is made. You can always count on uniform high quality when you use Pennsalt Potassium Chlorate. Pennsalt guards every step of Potassium Chlorate manufacture with rigid quality control, thus producing Potassium Chlorate that is rapidly and completely reactive.

Write us for further information about Pennsalt Potassium Chlorate.

PENN SALT

CHEMICALS

PENNSYLVANIA SALT MANUFACTURING COMPANY
PHILADELPHIA 7, PA. TACOMA, WASHINGTON

FEATURED CHEMICALS in the PFIZER FAMILY

- Ammonium Oxalate
- Ascorbic Acid
- Bi-Cap Flour Enrichment Mixtures
- Bismuth Preparations
- Calcium Gluconate
- Citric Acid
- Citrate Esters
- Cream Tartar
- Fumaric Acid
- Gluconic Acid
- Glucono Delta Lactone
- Iron and Ammonium Citrates
- Iron and Ammonium Oxalate
- Iron Gluconate
- Iron Oxalate
- Itaconic Acid
- Niacin
- Niacinamide
- Oxalates
- Penicillin
- Potassium Iodide
- Potassium Oxalate
- Riboflavin
- Rochelle Salt
- Sodium Citrate
- Sodium Gluconate
- Tartaric Acid
- Thiamine

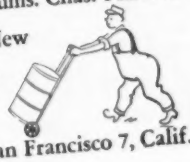
—and many other chemicals

no. 12 in a series:

CREAM OF TARTAR

Among the manufacturing chemists of America, the pioneer in tartrates is Chas. Pfizer & Co., Inc. Meeting steadily growing and broadening demands in the food and medicine industries, Pfizer Cream of Tartar has continued to reflect the original high standards of its makers.

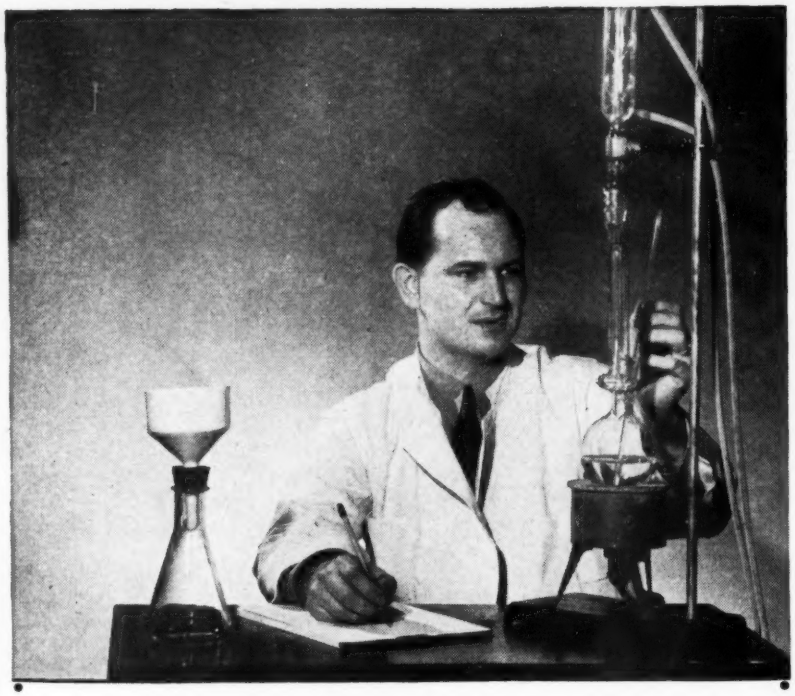
Among today's important uses of this acid potassium salt of tartaric acid, perhaps the best known is its service as a leavening agent in baking powder. It is supplied by Pfizer in fine granular or powdered form—in barrels, kegs or drums. Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Avenue, Chicago 10, Ill.; 605 Third Street, San Francisco 7, Calif.



PFIZER

Manufacturing Chemists Since 1849

FOR YOUR INFORMATION



NEW monsanto plasticizers are on the way...

During the period of material shortages that have affected the availability of many plasticizers, Monsanto Research Chemists have been engaged in developing entirely *new plasticizers* that are far more versatile and adaptable in their applications. These new plasticizers promise to set new standards of flexibility... volatility... burning rates... heat and light stability... permanence... electrical properties... abrasion resistance... elasticity.

Field tests on these coming Monsanto products will be continued, so that performance characteristics will have been established by the time material supplies are more plentiful and added production can be expected. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

Present Monsanto Plasticizers

Aroclors... Dibutyl Phthalate... Diethyl Phthalate... Dimethyl Phthalate... HB-40... Ortho-Nitrobiphenyl... Santicizer 8.... Santicizer 9... Santicizer B-16... Santicizer E-15... Santicizer M-17.... Santicizer 140... Triphenyl Phosphate... Tricresyl Phosphate.

Exposure Tests Prove Resimene 875

Practical field experience is now available in addition to laboratory data to demonstrate that protective coatings using Resimene 875 withstand the severe punishment of prolonged exposure to all types of weather. Other advantages of this organo-soluble melamine resin recently developed by Monsanto's Plastics Division include better color retention (in colors as well as white), and improved abrasion and alkali resistance. Resimene 875 also makes possible reductions of 50% and more in curing times.

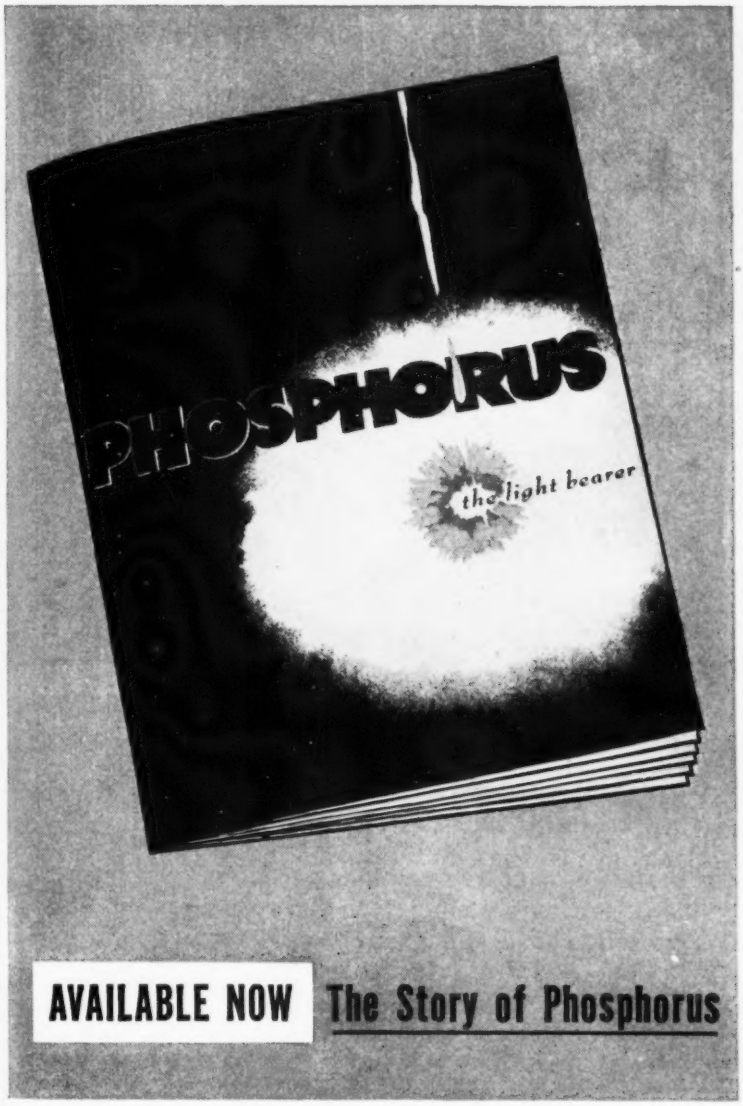
New, Permanent Water Repellent

A new water repellent has been announced by Monsanto's Textile Department with two important features: (1) *Durable* water repellency, practically unaffected by laundering or dry cleaning; (2) Outstanding effectiveness on *all* textile fibers, including wool, nylon, acetate, cotton, rayon and mixtures of these fibers.

In addition the new product imparts a full, soft "hand" to the finished fabric, leaves no residual odor and adds good resistance to spotting. It has little effect on tensile strength or weight of the fabric and does not affect air permeability.

The new water repellent is supplied in a 33% aqueous dispersion readily diluted with water at room temperature. No special equipment is required for application and no odors are given off during application.

Complete technical information, samples and counsel on adapting the new Monsanto water repellent to fabrics are available from Monsanto Chemical Company, Textile Chemicals Department, 140 Federal Street, Boston 10, Mass.



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Laboratory tests have their value in proving the effectiveness of a germicide, but field tests under actual service conditions are obviously much more dependable.

Alkyl Dimethyl Benzyl Ammonium Chloride was just recently tested under field conditions by a midwestern health department. This test was made in a large beverage shop serving wine, beer and soft drinks, equipped with a 3-tank set-up for glass washing.

Conditions of Tests

The test involved cold sanitizing of glasses after washing in detergent solution in the first tank with stationary brush, rinsing in the second tank and sanitizing in the third tank. Various test runs were made, each consisting of treating 700 glasses – every *tenth* glass being immediately handed to the sanitarian for swabbing. The time interval between removal from the tank and swabbing by the sanitarian was in no case in excess of 30 seconds.

**These data are taken from a paper by W. L. Mallmann and E. W. Kivela, of the Michigan Agricultural Experiment Station, and Gray Turney, of the Lansing Department of Health, presented before the National Association of Insecticide & Disinfectant Manufacturers. Copies of this paper will be furnished on request.*

Results of Tests

Run #1: This determined the bacterial load involved. Every tenth glass from the rinse tank was swabbed and tested. The bacterial count ranged from a minimum of 1000 at the beginning of the run to a maximum of 2000 at the end.

Run #2: Every tenth rinsed glass was sanitized in a 170 ppm sodium hypochlorite solution. 52 of the 70 glasses showed no bacteria. 18 were positive, with an average count of 18. The strength of the hypochlorite solution dropped from 170 to 65 ppm at the end of the run.

Run #3: Every tenth rinsed glass was sanitized in a 1 ounce to 5 gallon solution of Alkyl Dimethyl Benzyl Ammonium Chloride (1-6250 dilution on a 100% basis). 53 of the 70 glasses showed no bacteria. 17 were positive, with an average count of 9. At the end of the run, the concentration of the solution was the same as at the beginning.

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More from Less

by ROBERT L. TAYLOR, Editor

THE WAR HAS HASTENED a trend in the industrial development of this country which is going to be basic in determining the plans and policies of American chemical manufacturers for a good many years.

Largely out of necessity—which still seems to be a prolific parent of invention—American industry over the coming years is going to have to pay increasing attention to the already present problem of getting more finished products out of less raw material—less in the sense of either quantity or accessibility, or both.

Actually it is only recently that this consideration has become an important influence in our industrial scheme of things on the west side of the Atlantic. It wasn't so many years ago that industry's function was simply to supplement nature—to get nature's bounties into a more usable form. There was an abundance of all things, and if they could satisfy the needs of life in the form nature made them, everybody—with the exception of a few visionary malcontents—was happy.

Then, however, the idea gradually began to take hold that man could improve on nature as well as supplement her. This line of thought has culminated in today's "age of synthetics" and has been largely responsible for the tremendous growth of chemical industry in the present century.

The influence of conservation first crept into the American industrial scene via the metal and lumber industries, when the exhaustion of the richest lands gave rise to seeking and working of secondary areas and the reworking of earlier stands. During the war it was particularly emphasized by the rapid depletion of many of our important mineral reserves. Today the thought of more efficient utilization of raw materials is shaping decisions in many industries where only a few years ago it was of little or no concern.

This trend will affect makers of chemicals in at least two important ways.

It of course means that alternate sources of chemical raw materials will be reviewed more frequently, with regard to both cost of the material and cost of processing. More attention will be devoted to efficient utilization and recovery of materials, through higher yields and conversion of wastes to useful products. The trend toward higher useful output per unit input will receive still greater impetus.

Secondarily, but more pronounced in its overall effect, will be an inevitable expansion on a large scale of the production of processing chemicals of all types. Wherever chemistry can make a cheaper material replace, extend or improve a more expensive material, it will find a ready market for its products and services. And as more natural materials move over into the "expensive" column by virtue of their scarcity, the opportunities for chemistry are correspondingly increased.

Nowhere has this been more apparent than in the lumber industry over the past few years. In a very short space of time lumber producers have moved from a minor into a major position as consumers of chemicals. The manufacture of plywood, alcohol, and composition boards from wood wastes are now all using chemicals in varying amounts. The Christmas tree industry has become a sizable customer for phthalic anhydride and glycerine, for making alkyd coatings to cut down spoilage of the trees during shipment. One West Coast laboratory is working on solvent drying of lumber to cut drying time and recover valuable resins and other chemicals from the wood.

Going over to the metals, we find the same thing happening. Flotation and chemical methods of recovering minerals are gaining at the expense of mechanical methods as the grade of available ores declines. A case has just come to our attention where a copper mine in the West is being readied for reworking a fourth time, to process still lower grade material.

This great industrial program of making more from less is still in its infancy. It was felt in other parts of the world before it became noticeable here, but as the pressure grows for a higher world standard of living, its international implications are bound to increase. It will require the application of chemical knowledge of an increasingly high order.

What's New

WITH THIS APRIL ISSUE, we take more than ordinary pride in introducing to you another new CI service. It is designed specifically to simplify the growing task of keeping up with significant industrial, scientific and commercial developments in the chemical industries.

It is in the form of a new section, known as *What's New,* which will henceforth appear in CHEMICAL INDUSTRIES every month just ahead of the feature articles. This prominent location in the magazine is an indication of the hopes and aspirations we have for this new section. We believe it offers something new in original, concise and interpretive chemical reporting.

We will bring you in this section each month our own CI reports, garnered from first-hand sources, of the most outstanding trends, developments and happenings that are taking place in the broad field covered by the chemical process industries. We believe there are certain things that every person in a responsible position in the chemical field will want to know just as a matter of information—whether he is a chemist, chemical engineer, salesman or manager. The presentation of that type of information in a relatively small space each month is the type of service we are trying to provide in *What's New.* The items are definitely not written for specialists on the subjects. We are trying to present each story as simply as possible, along with some discussion of why and how it is important and what it may hold for the future. Facts without interpretation, we believe, are like truth without meaning—empty and lifeless at best. And what is happening these days in the chemical industries is far from that.

So it is a new kind of job we are trying to do for you in this new section, one that we trust will make your own job easier. We hope you like it. If you have any ideas for making it better, we shall be glad to hear them.

Cutting Cost Corners

WITH THE EMPHASIS again on profits, many chemical companies are finding that an added efficiency here and there will pay off as much as a 2 per cent increase in yield, or an hour's cut in operating time. Such things as better plant layout, tidier housekeeping, or improved materials handling may jump profits as much or more than a new plant or expensive hours of research on process improvement.

Materials handling, for instance, is an operation which has benefited through revolutionary techniques within the past few years. Our Packaging & Shipping editor tells us that a lot of chemical men were among the 10,000 visitors at the Materials Handling Exposition in Cleveland last winter, and there was heightened interest in the improved equipment and methods.

A survey made at war's end by *Modern Industry* adds support to the claim of increased concern with the problem. Close to half of the chemical companies questioned reported plans to modernize their handling methods by the purchase of industrial trucks, skids and pallets. Over half intended to install new conveyor systems.

We're not worrying about the 47 per cent who are buying skids and pallets, the 44 per cent who are getting new trucks, or the 56 per cent who are putting in new conveyors. But we are wondering about the many firms who are not planning any such moves. Do they already have up-to-date systems or are they going to limp along with old-fashioned methods until their sharper competitors put them out of business?

Are We Being Smart About Exports?

NOT FULLY APPRECIATED YET is the effect the recent change in U. S. foreign policy—exemplified by our pending loans to Greece, Turkey, and Korea—will have on foreign trade. Whether we like it or not, the U. S. is destined to play an increasingly important role in world affairs and foreign markets.

Loaned U. S. dollars must eventually be spent in the U. S. And the American chemical industry is in a position to benefit from a fair share of these dollars. Today the U. S. is the world's top producer of chemicals. A real opportunity exists for U. S. chemical makers to develop foreign markets—especially in those countries which have long relied on Germany for supplies. Yet the simple fact is that many producers have shunned foreign trade possibilities, or worse, have permitted the U. S. to fall into bad odor as a trader.

There is a black market in certain chemicals today—especially where export shipments are involved. More than one person has approached CHEMICAL INDUSTRIES' editors within the past few months, seeking hard-to-get chemicals at any price.

They approach us coyly. "We know these items are scarce, but you must know someone who will supply—at a price, of course. We need this for export—what it costs doesn't matter."

Most chemical producers have handled their affairs in a manner above reproach. They have held the price line; they have sold at a fair profit. But often their products have been sidetracked, and their trademarked packages appear on foreign wharves at exorbitant prices. Thus they have, unconsciously, garnered a good deal of ill-will.

Just as none of us has forgotten which butcher, which grocer, or which automobile dealer tried to take advantage of us during the past few years, so foreign chemical buyers will not forget which companies—and which country—tried to exploit them in the period of chemical shortages. The present activities of a minority of traders can seriously impair the development of a sound, profitable export business.

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a water-dispersible toxicant containing 25% DDT by weight. Answers the demand for a residual type DDT water spray.

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What's new

SILKY SYNTHETIC

Vinyon N, Carbide & Carbon's vinyl chloride-acrylonitrile synthetic fiber to go into production.

SEVERAL TEXTILE mills are already experimenting with small batches of Vinyon N, a new vinyl material basically different from its forerunners.

The new yarn is a copolymer of vinyl chloride and acrylonitrile, a white, powdery resin which is made into a fiber by dissolving it in acetone and spinning on equipment similar to that used for acetate rayon.

Inherently rotproof and flame-resistant, Vinyon N is strong, shrinks less than half a per cent in boiling water, and takes dyes successfully. Unlike most synthetic fibers, the new yarn is warm to the touch and has a silky feel.

The present fiber is light gold in color, but it is said that a white yarn will soon be produced. The yarn can be bleached, however, with sodium chlorite.

Prospects

Carbide & Carbon officials, looking at these advantages, expect their product to go places—exactly where, though, they don't venture to guess until more extensive experiments are carried out this summer. Development units are now being built at South Charleston, W. Va., but it will be some time yet—two months at the least—before they are operating. Thereafter both the resin and the finished yarn will be obtainable from Carbide's New York office for testing and small-scale fabricating.

Its use in women's wear—foundation garments, dress goods, bathing suits and full-fashioned hosiery—are being explored. So far, results show that the fabrics are of a good color and hold their shape well. Raincoats and sportswear are also in the offing, for Vinyon is water-resistant.

The chemical industry—producer of the new fiber—may also be a customer for it in the form of filter cloths.

Nettings, draperies, rugs, upholstery fabrics and fishing lines will possibly profit from the fiber's abrasion and flame resistance.

One guess is that Vinyon N will fall—both property-wise and pricewise—between rayon and nylon. While it may have a hard time carving a niche for itself in their special bailiwick, women's wear, it should find wide use in those other applications where the vinyl's unique qualities can be exploited.

Vinyon N's chief vantage ground: strength and dimensional stability at boiling temperatures, puts it head and shoulders above earlier vinyl fabrics and extends the vinyls' scope into new fields of usefulness.

BOWMAN'S DEMON

A new molecular distillation unit yields sharper separation and higher recovery.

NEARLY a hundred years ago the eminent Scottish physicist, James Clerk Maxwell, hypothesized a demon which could separate molecules according to their velocities—the fast ones could pass, but the slower would be held back. Maxwell's Demon was a purely imaginary device to aid him in visualizing the abstruse physics of gases, and he never dreamed that man would contrive such a spirit. But John R. Bowman, Mellon Institute Fellow, has invented a new fractionating molecular distillation unit that comes a good deal closer to doing the job of Maxwell's Demon than the great kinetic theorist would have dared to fancy.

It was in the laboratories of the Eastman Kodak Company that K. C. D. Hickman did much of the pioneering work on molecular distillation—a development that has permitted the separation (or concentration) of many large molecules at temperatures far below their boiling points: far below their decomposition temperatures. But the single-pass molecular still, like the hillbilly's mountain still, is limited in its ability to make sharp separations simultaneously with high recoveries, for all the components present distill over—the lighter ones in the early stages, followed by increasing amounts of the residue material.

Thus Dr. Bowman's new twist which introduces rectification into molecular distillation is an advance analogous to the advent of multiple-contact fractionation in the days of simple distillation from a single pool of boiling liquid.

How it Operates

Although the overall results of molecular distillation are directly parallel to those obtained in equilibrium distillation, the mechanism is quite different. In ordinary distillation one deals with vapor pressures and vapor-liquid equilibria. In molecular distillation there is no real vapor pressure and there is no equilibrium, for the pressure is reduced to a point where the mean free path of the molecules exceeds the distance between the evaporating surface and the condenser surface—in other words, collisions between molecules are nil. Under these conditions liquids do not boil; the component molecules simply diffuse away from the liquid surface when they have received enough energy to make their own way in the evacuated space of the still. When these diffusing molecules reach a cold surface which absorbs their gaseous energy they condense to liquids. Separation of different molecules results from the fact that the rates of diffusion of different kinds of molecules are different.

J. R. BOWMAN: Speedy molecules get through.

In general, molecules diffuse at rates which are inversely proportional to the

square roots of their individual molecular weights.

The problem of achieving a continuous, counter-current fractionation by thermal diffusion is the one that Dr. Bowman has solved with his new device. The rectification achieved in ordinary equilibrium distillation is adiabatic in so far as the packed or plate column is concerned, whereas rectification by thermal diffusion requires that the diffusing molecules be alternately vaporized and condensed by the alternate addition and subtraction of heat. The changes from liquid to vapor and back again must be only partial changes so that there can be a net upward movement of vapor and a net downward travel of the liquid. At each alternation there is an incremental increase in concentration of the faster diffusing molecules in the vapor space, and a corresponding depletion of the lighter molecules in the liquid.

To achieve the desired alternation of partial vaporization and condensation Dr. Bowman has contrived a simple, but effective mechanism. The vaporizing element is a vertical tube, heated from the outside, with the reflux or feed liquid running down the inner wall in a continuous falling film. Inside this tube and concentric with it, is a rotating cylinder. This inner element is internally cooled and serves as the condenser surface. The speed of rotation of the condenser cylinder is such as to throw any liquid condensate back onto the vaporizing element by centrifugal force. With this ingenious arrangement the main flow of diffusing molecules is radially inward from the vaporizing tube, and the condensate is returned as a centrifuged spray.

Field of Promise

The first applications of Dr. Bowman's new still will doubtless be in the same field that has employed Dr. Hickman's molecular distillation—the concentration of vitamins from fish oils. Its greater power to separate and to rectify, however, make it a promising tool for research and analysis, and augurs still wider use in more difficult separations heretofore impossible or uneconomical. The molecular still does not threaten the use of conventional rectification equipment though, for it is an extravagant consumer of heat. It must find its place where its relatively high cost can be justified by the unique results it is capable of producing.

HI-OCTANE ACETYLENE

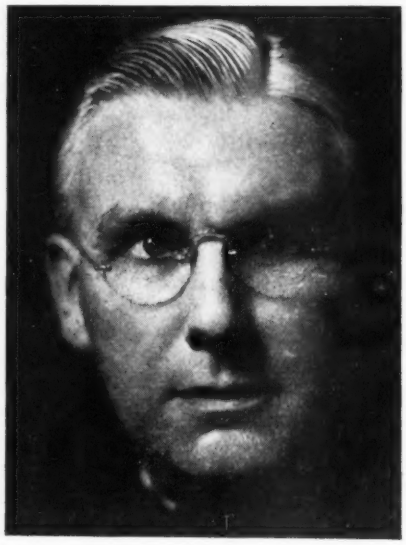
An engineering problem in coal hydrogenation was instrumental in advancing high-pressure acetylene chemistry.

PROCESSES DEVELOPED in Germany for reactions with acetylene under pressure are now getting a toe-hold in American chemical industry. Production of vinyl ethers, made by the addition of alcohols to acetylene, has been undertaken by General Aniline & Film Corp., and recently Carbide & Carbon Chemicals Corp. has also offered a series of these compounds.

Professor Herman Mark, of the Polytechnic Institute of Brooklyn, and formerly a colleague of Dr. Walter Reppe at I. G. Farbenindustrie, tells an interesting tale concerning high-pressure acetylene beginnings.

Hydrogenating Coal

It all started with the Bergius process for making liquid fuels by hydrogenation



HERMAN MARK: Acetylene was tamed.

of powdered coal. Among the waste by-products of this process were hydrocarbon gases usable as fuel—not enough better than coal itself, though, to justify the expensive processing. It proved to be impossible to modify the reaction, even in plant-scale production, to obtain less of the undesirable gaseous products, and so, remembering the work of Berthelot, the I. G. chemists passed the gases through a hot tube and got 15-17 per cent acetylene per pass.

The big problem now was to separate the acetylene from the other gases so that the latter could be recycled. They found out that the best way was to take advantage of acetylene's solubility in water under pressure, sweep out the other gases, and then release the pressure and recover the acetylene from the water.

Explosion Worries

The words "acetylene" and "pressure" in juxtaposition made them wince—and small wonder. They knew that acetylene under pressure would explode at the drop of a hat.

There followed an intensive fundamental study of the properties of acetylene. Detonation, they thought, was due to the presence of metal acetylides. Then they discovered that *pure* metal acetylides themselves were not dangerously explosive, but that in the presence of acetylene they catalyzed the formation of highly explosive vinylacetylenes.

The problem was finally solved by dispersing metal acetylides throughout the pressure system, where they act like "anti-knock" agents—promoting small explosions and thereby preventing large ones. Bearing out their theory, the scientists further discovered that metal acetylides are good anti-knock agents for gasoline, and conversely, tetraethyl lead is a good explosion preventive for acetylene.

Thus did the solution of a relatively minor engineering problem in the Bergius process remove an obstacle which permitted the opening of a whole new field of chemistry.

NO STEEL, NO DRUMS

Big bottleneck is sheet steel. More is on the way, but not for eight months or a year.

CLOSE TO 31,000,000 steel drums were turned out last year. While this output doesn't come up to peak wartime production, it is still 10 to 15 per cent higher than prewar. Nevertheless output of chemicals has risen so greatly that there still aren't enough drums to go around.

Lack of drum fabricating facilities is certainly not the cause of the shortage. Manufacturers report that even during the war their ability to turn out drums was ample, and now they are operating at 40 to 50 per cent of capacity. It is a shortage of sheet steel that is keeping the wheels from turning. All sheet is scarce, and the lighter weights—19 gauge or less—are especially short.

When Will It Ease?

When can you stop queueing up for drums? Not for at least eight months, say industry spokesmen, and probably over a year. Strikes in coal or steel, or both, are unforeseeable contingencies which could put off the expected betterment even longer. Steel men are planning an additional 2,000,000 tons of rolling capacity—some 8 to 10 per cent above present figures—but none of it will come in until early next year. In the meantime, steel sheet is going in large measure into consumer items not made during the war: automobiles, refrigerators, etc.*

The industry is wrinkling its collective brow over the fact that the drum shortage is forcing customers into using other materials. They take heart, however, in the knowledge that paper and fiberboard are tight, too, as is the steel reinforcing necessary to make the drum's most serious competitor, the steel-reinforced fiber

* Highly significant is the acquisition by steelmakers themselves of 87 per cent of heavy drum and barrel capacity since 1941, before which time they owned only 10 per cent.

drum. More chemicals are going into aluminum and stainless steel, but these are materials that the drum people themselves can use and is hence no competitive threat.

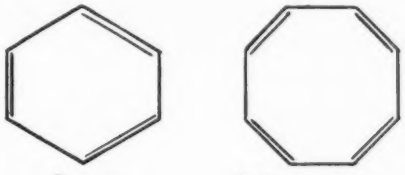
Only one group will be sorry to see the shortage go.

The second-hand drum dealers are doing a whopping business, and they will continue to until the single-tripper again becomes really a single-tripper.

CYCLOOCTATETRAENE

Not the basis of a new aromatic system but a potentially profit-making chemical.

BACK IN 1911 the German chemist, Richard Willstaetter, wanted to study the compound cyclooctatetraene. His interest



Benzene Cyclooctatetraene

was academic. Like benzene, which contains six carbon atoms in a ring with three conjugated double bonds, cyclooctatetraene is a ring compound, of eight carbon atoms, with conjugated double bonds—four in this case. And just as benzene is the parent substance of some 300,000 or more aromatic compounds, so Willstaetter thought that cyclooctatetraene might become the basis of a new aromatic system.

Willstaetter used a naturally occurring starting material—an alkaloid from the bark of an Italian species of apple tree which has the eight-carbon ring already formed. By an eleven-step synthesis he converted 200 lbs. of the bark into a few grams of the golden yellow oil he set out to prepare.

Many attempts have been made to duplicate Willstaetter's work, but only recently did anyone succeed in obtaining the material described by him. The synthesis is not only laborious and tricky, but the yields are picayune. But by high-pressure techniques cyclooctatetraene can be made in 90 per cent yield or better from acetylene. The gas is simply dissolved (in tetrahydrofurane or some other solvent) and agitated at 80° C. and 15 atmospheres pressure in the presence of a nickel cyanide catalyst. The solvent is distilled off first and the product then comes over at 143° C. This synthesis was first carried out at Ludwigshafen by Reppe and his collaborators in 1941.

Possible Derivatives

But what good is it? It will not form the basis of a new aromatic chemistry, for it is only half as aromatic in character as benzene. It behaves more like a polyolefin.

Even though this hope has been dashed, cyclooctatetraene has other properties which give it the luster of a nova. Hydrogenation to cyclooctene followed by oxidation gives suberic acid, the eight-carbon dibasic acid intermediate between adipic and sebacic acids. This development can conceivably give rise to some new plastics and plasticizers. Treatment with nitric acid isomerizes and oxidizes the substance to terephthalic acid, component of a new synthetic textile fiber (see CHEMICAL INDUSTRIES, December, 1946, p. 1034), and a dibasic acid of wide promise in plastics and as an organic intermediate. Still another isomerization takes place in concentrated sulfuric acid, this time giving styrene.

Octacyclotetraene is capable of forming polymers, and the large number of active double bonds gives rise to various degrees of cross linking. The material is especially interesting as a compolymerizing agent with other polymer-forming materials.

The same treatment of acetylene at higher temperatures gives a material which may be the ten-member ring with five double bonds, and at still higher temperatures the product obtained has the empirical formula $C_{12}H_{12}$ and is presumably cyclododecahexaene.

SOYBEAN SAGA

Cincinnati's Drackett Company, of Drano and Windex fame, is building a new wing onto its industrial house, with soybeans as the foundation.

WHEN Robert A. Boyer, father of the well-publicized soybean Ford, moved from Dearborn, Mich., to Cincinnati, Ohio, in 1941 to take charge of soybean research for The Drackett Co., people suspected that Drackett must be going into the soybean business. What these people didn't know was that Drackett had been in the soybean business since the middle thirties, and was at that very moment in the midst of a broad investigation of the industrial possibilities of soybeans under the guidance of its director of research, Dr. W. C. Gangloff.

After declaring a partial wartime moratorium, the Drackett research staff is now back hard at work on soybeans. But the program pattern has changed somewhat from prewar. Whereas before the work had been spread over a large number of fields, including adhesives, lecithin emulsifiers, and food products such as scrapple and dry cereal, today it is being concentrated on three items: plastics, fibers, and industrial proteins.

New High Impact Plastic

The program on plastics is the most advanced. A new plant is being completed this month at Sharonville, just outside Cincinnati, which will make a new high impact strength plastic of a soybean-protein-modified phenol-formaldehyde type. Better flow characteristics than other high impact plastics is claimed for the Drackett product. Chopped tire cord or macerated cloth is used as the filler.

A unique method is being used in the marketing of the material. About 90 per cent of it is being sold in preformed discs, cubes, rectangles and other standard shapes. This means enormous savings in shipping and storage space, since the fluffy bulk molding material has a volume ratio to the finished molded article of 10 to 1, while the preforms have a volume ratio of only 2 to 1. Furthermore, the molder is saved the trouble of weighing out the required amount of the bulk material and making his own preforms. For its volume production of preforms Drackett has found another quirk: die-cutting them from sheeted stock rather than using forming presses. The economy is said to be substantial.

A new soybean fiber plant, also at Sharonville, began production last September. Sold under the name Drackett azlon,* the fiber, when blended with rayon

* Azlon is the new generic name for all man-made protein textile fibers. It is not a trade name.

DRACKETT AT SHARONVILLE: Soybean plastics, soybean fibers, soybean proteins.

or cotton, is said to impart an unusually desirable "hand" or feel to a fabric.

Soybean Proteins Expanding

The industrial proteins program is in the semi-works stage, current production amounting to between 2,000,000 and 3,000,000 lbs. a year. The material finds uses similar to those of casein in the rubber, plastics, adhesives, paper, textile and coatings industries. The company reports that the market for such material is increasing rapidly, while casein production has declined due to the increased demand for dried skim milk.

Drackett believes that it is hardly beginning to get under way in the soybean derivatives field. It points out that the beans are inherently a good industrial crop in that they are easier to take care of and easier to harvest than most other protein crops, such as corn. Also, great strides have been made in increasing the yield per acre. Drackett is happy, too, about its Cincinnati location. Farmers shipping their crop east or south for stock feed can work in a stopover at Cincinnati to have the oil extracted without any extra freight cost.

GOOD BY TWITCHELL?

After 57 years, Twitchell's reagent appears to have met its superior in producing fatty acids.

LACK OF enterprise has not been the reason Ernst Twitchell's famous acid catalyst batch process has reigned supreme in the fat-splitting industry since 1890. Fatty acid producers have long sought a workable continuous process for splitting fats and oils into their acids and glycerine, but the obstacles have been numerous and difficult.

It was thus with more than ordinary interest that members of the American Institute of Chemical Engineers, at their recent regional meeting in Louisville, listened to a paper describing for the first time the water hydrolysis (or splitting) of fats by a new continuous method. Well beyond the speculative stage, the process is the result of eight years of developmental and pilot plant work by the Colgate-Palmolive-Peet Co., Procter and Gamble Co., and Emery Industries. It is already supplying sizable quantities of fatty acids for soaps, cosmetics, lubricants and similar products.

For producers splitting 3,000 pounds per hour or more of oils or fats, the new process is claimed to give cheap, simple, continuous, conversion of the fat to good quality fatty acids plus a 15-25 per cent aqueous solution of glycerine which may be readily concentrated and refined to a chemically pure product. Yields are said to be in the range of 95-99 per cent, compared with a maximum of about 95 per cent by the Twitchell process.

According to Dr. H. D. Allen, of Colgate, who presented the paper, the process will handle triglyceride oils of any degree of acidity and any quality. Pilot plant runs have been made on various grades of tallows, greases, coconut oil, soybean oil, fish oils and acidulated cottonseed soap stock, all of which gave yields of 95 per cent or better. Aside from being continuous and giving better yields, another advantage of the process over Twitchell's is the elimination of need for a catalyst.

Twitchell Accounts for Half

About half of the fatty acids produced today are made by the Twitchell method. This involves boiling the fatty oil and water together for 30 to 48 hours along with a small amount of acid catalyst. Sometimes the hydrolysis is carried out in countercurrent stages to reduce the amount of water needed and increase the concentration of the recovered glycerine. Yields up to 95 per cent are ordinarily obtained.

About another quarter of today's production is made by the batch autoclave method, which, as the name implies, is carried out in an autoclave at about 150 lbs. pressure and uses a metallic oxide or hydroxide catalyst. It requires 6 to 10 hours per batch and gives yields of 95 per cent or better. With any method using a catalyst, some neutralization or washing is necessary to remove the catalyst after the reaction is complete.

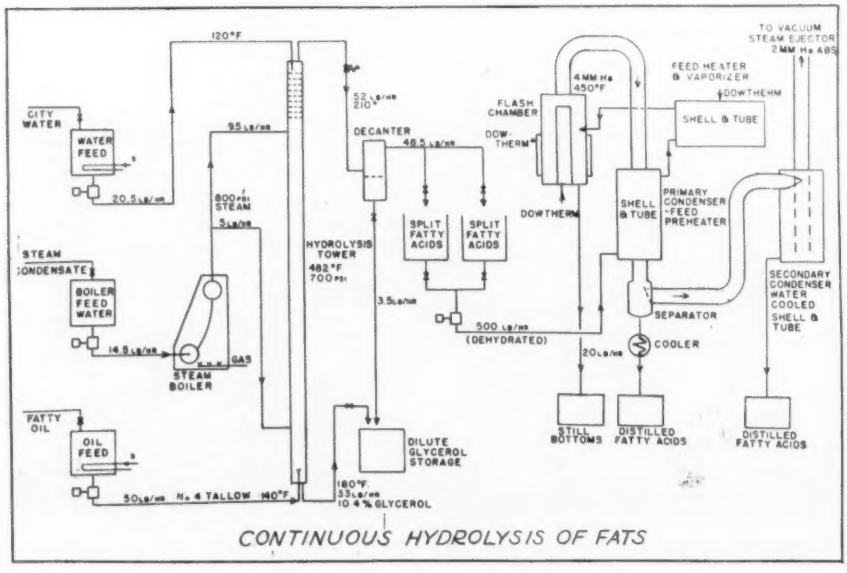
The continuous process, it is estimated by Dr. Allen, already accounts for nearly the final quarter of present production, with the exception of a small amount done by use of enzymes. Continuous process plants of varying sizes are being operated by Colgate at Jersey City, Procter and Gamble at Ivorydale, Emery Industries at Cincinnati, and General Mills at Kankakee, Ill. Armour and Swift both have plants in process of construction at Chicago.

The Continuous Process

Based on patents granted to Ittner, of Colgate; Mills, of Procter and Gamble, and Brown, of Emery Industries, the continuous process consists essentially of contacting the oil and water in countercurrent flow through a stainless steel tower at 700 lbs. pressure and 485° F. The water enters the tower at the top and falls as droplets through the fatty oil coming up from the bottom. In so doing, the water partially dissolves in the fatty phase, and when it reaches the heated midsection of the tower the reaction takes place.

The upper section of the tower contains trays equipped with risers and serves as a stripping section, the downcoming fresh water extracting the glycerine from the upcoming fatty acids. The fatty acids are discharged from the top of the tower through a back pressure control valve to a decanter and are then purified by vacuum distillation. The dilute glycerine solution is taken from the bottom of the tower.

In the opinion of those in the fatty acid industry, the continuous process is definitely the thing for large scale operations. Most of the country's fat splitting, they predict, will eventually be done by this method.



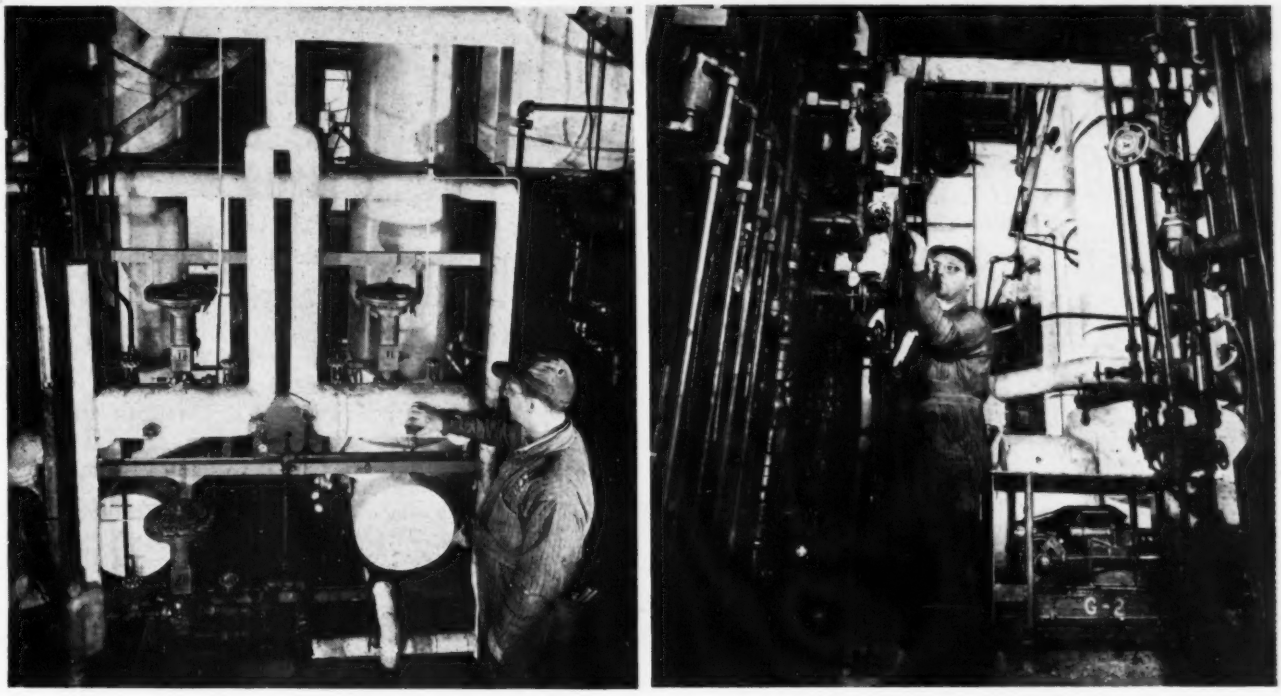
CONTINUOUS HYDROLYSIS OF FATS

TECHNICAL DATA INDEXED

A comprehensive index guide to the reports on wartime technological developments in the U. S., Germany, and other countries, has been prepared by the Office of Technical Services, Department of Commerce. It is intended for use with the OTS' weekly Bibliography of Scientific and Industrial Reports, in which some 60,000 reports have been documented.

The new Index contains some 45,000 cross reference entries classified under major subject headings. Each entry lists the file number of the report and page number of the Bibliography abstract.

It is available from the Superintendent of Documents at 50 cents a copy.



Front and rear of stabilizer (H_2S removal) and debutanizer before final thiophene purification.

THIOPHENE

A New Industrial Chemical from Butane and Sulfur

by H. E. RASMUSSEN* and F. E. RAY**
Research and Development Department
Socony-Vacuum Laboratories
Paulsboro, N. J.

THE PRODUCTION OF THIOPHENE by the dehydrogenation and cyclization of butane with sulfur, as well as the recovery of thiophene thiol and other by-product sulfur compounds, provides industry with new low-cost raw materials for the manufacture of many potentially valuable benzene analogs.

THIOPHENE, discovered in 1882, was recognized as a reactive and versatile chemical, but its synthesis was costly, and it was seldom prepared in quantities sufficient for large scale investigations. Utilization of the reaction of n-butane with sulfur today makes thiophene available in commercial quantities and opens the way to large scale studies of its chemistry and industrial applications in such diverse fields as pharmaceuticals and as a fuel additive.

HISTORY OF THIOPHENE

In 1882 one of Victor Meyer's routine lecture demonstrations failed, and a basic new chemical was discovered. The lecturer was illustrating the indophenine color reaction with isatin which was then considered characteristic of benzene. In this particular experiment, however, there was no coloration. Meyer sought the cause, and found that a laboratory assistant had provided him with synthetic benzene, instead of the coal-tar product he had always used. His subsequent isolation and characterization of the compound in coal-tar benzene really responsible for the color reaction, and which he christened "thiophen", is a story familiar to all organic chemists.

Thiophene was soon recognized as a versatile chemical, but its high cost of production prohibited its use as a chemical raw material. It was recognized commercially only as an annoying contaminant of coal-tar benzene, removable at considerable trouble and additional cost.

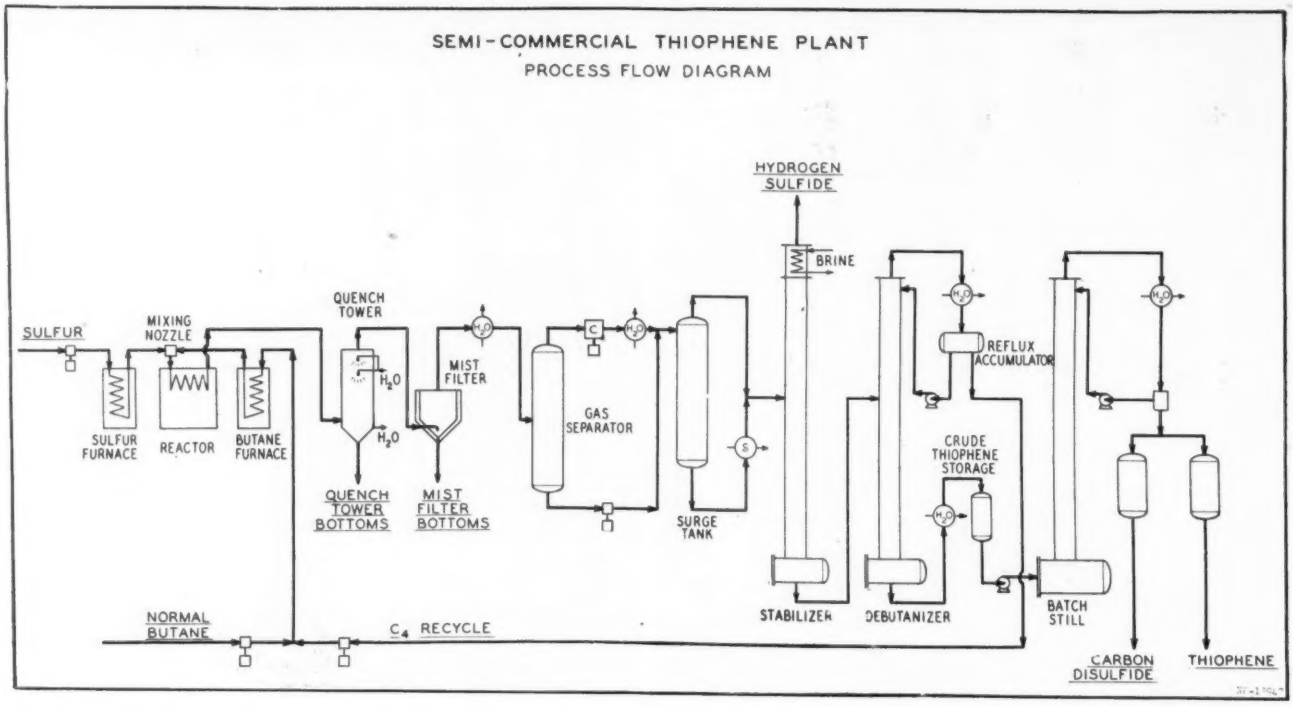
Thiophene is a water-white refractive liquid possessing a pleasant aromatic odor. It has a specific gravity of 1.064, normal boiling point of 84.1°C, (183.4°F) and a freezing point of —38.3°C, (—36.9°F). It forms azeotropes with water and many polar organic compounds. It is completely miscible with most organic solvents, but is insoluble in water. It is an excellent solvent, being about equivalent to benzene, but since it feezes some 70°F lower than benzene its versatility as a solvent is considerably enhanced.

Little is known as yet about its toxicity. It is reported to be about as toxic as benzene.

THERMALLY STABLE

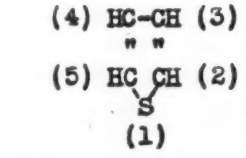
Thiophene unlike most organic sulfur compounds is thermally stable. Whereas sulfur-containing hydrocarbons usually decompose on heating, giving off hydrogen sulfide, thiophene can be heated to 1600°F with no evolution of hydrogen sulfide or other apparent decomposition.

* Chemical Engineer, Process Development Division.
** Chemical Engineer, Chemical Division.



CHEMICAL PROPERTIES

The structural formula customarily assigned to thiophene is



The nuclear sulfur activates the 2 and 5— hydrogen atoms, promoting substitution in these positions. Thiophene is readily nitrated, sulfonated, halogenated, mercurated, and under certain conditions alkylated. In addition, it can be acylated with acid chlorides or anhydrides in the presence of traces of certain catalysts and condensed with formalin and ammonium chloride to produce various nitrogen derivatives some of which are resins. Thiophene's pronounced reactivity permits the use of mild catalysts and reaction conditions.

There are two approaches to the development of thiophene chemistry. The first is to synthesize and evaluate the analogs of benzene derivatives, which is an extensive field. The second is to expand and utilize the unique chemical properties of thiophene itself.

USES

The first response to the announcement of the availability of thiophene was from the pharmaceutical industry. Many thiophene pharmaceuticals have been evaluated, but the unavailability of thiophene necessitated suspension of development. There are reports that certain of these compounds are less toxic than their benzene analogs, due presumably to the ready cleavage of the thiophene nucleus in the body. The demand for thiophene by pharmaceutical laboratories indicates a sustained interest in this field.

Thiophene-derived drystuffs are also being developed. Some reports state that higher tinctorial powers are obtained.

Thiophene reacts with formaldehyde under acidic conditions but, unlike phenol, it does not react at an alkaline pH. The primary products of this condensation, which are viscous liquids or plastic solids may be thermoset in acid pH at an elevated temperature in the presence of excess formaldehyde or hexamethylenetetramine.

Resins prepared from thiophene-phenol mixtures and formaldehyde, containing as much as 60 parts of thiophene to 40 of phenol, will thermoset at an alkaline pH.

The resinous forms of thiophene show promise as rubber compounding agents, plastics modifiers, and textile treating agents.

Thiophene itself has been described in applications as a special dewaxing solvent, and as a fuel additive.

DEVELOPMENT OF THE PROCESS

The original equipment used to react butane and sulfur was small laboratory apparatus in which the reactor was a heated porcelain tube. The first liquid product was about a 2-ounce composite of several runs which was fractionated in a semi-micro column.

The attractive yields obtained in the laboratory indicated the desirability for further development in larger sized equipment, and a unit capable of producing a few pounds of thiophene per day was constructed. The reactor was a stainless-steel coil in a lead bath. Subsequently this unit was enlarged to produce about twenty pounds of thiophene per day. Data obtained in this phase of the project have been published*, the process first being announced in January, 1945.

THE PROCESS

The Socony-Vacuum thiophene process is essentially a dehydrogenation of normal butane using sulfur as the dehydrogenation agent, followed by cyclization with sulfur to form the thiophene ring. The reaction is believed to proceed stepwise with conversion of the butane to butene, butadiene and finally thiophene. Hydrogen is removed by the sulfur, forming hydrogen sulfide. Side reactions include thermal cracking of butane to lighter hydrocarbons, complete dehydrogenation and sulfurization of cracked products to carbon disulfide, and polymerization, sulfurization, or both to a residuum. This residuum consists of thiophene thiols, thiophene homologues, and high-molecular weight, organic sulfur compounds. The following product distribution is typical for single-pass operation:

Component	*Weight Per Cent*
Thiophene	8
Butadiene	3
Butenes	6
Butane	26
Hydrogen Sulfide	37
Carbon Disulfide	2
Light Hydrocarbons	3
Residuum	15
Total	100

The semi-commercial plant is composed of a reaction system and a fractionation system. In the reaction system, C_4-hydrocarbons and sulfur are preheated, mixed, reacted, and quenched to arrest further reaction. In the fractionation system, the quenched reactor effluent is separated by conventional continuous dis-

* Rasmussen, Hansford, and Sachanen, Ind. Eng. Chem., *38*, 376 (1946).

tillation into the desired product streams. These streams are quench tower bottoms, light hydrocarbons and hydrogen sulfide, C_4-hydrocarbons for recycle to the reaction system, and crude thiophene. The crude thiophene is fractionated in a batch still into thiophene, carbon disulfide and still bottoms.

FLOW OF MATERIALS

Sulfur is melted (melting point approximately 240°F) in dual steam-heated pits and pumped through a coil in a gas-fired furnace where it is vaporized (normal boiling point, 832°F) and superheated to 1300°F. Normal butane fresh feed and C_4-hydrocarbon recycle from the fractionation system are pumped through a coil in a second gas-fired furnace where the combined hydrocarbon stream is heated to 1050°F. The hot sulfur and hydrocarbon vapors in about equal weight portions are then mixed and passed into a reaction coil placed inside a third gas-fired furnace. The reaction temperature is about 1050°F and the contact time is approximately two seconds.

The reactor effluent passes into a quench tower where it is quenched to 150-175°F by water sprays. Quench tower bottoms and water settle in two layers at the bottom of the tower from which they are separately and continuously withdrawn. The quench tower overhead passes through a glass wool filter to remove entrained liquid. The filtered gas is then cooled to room temperature and fed to a gas separator where the condensed liquid is collected.

The gas from the gas separator is compressed to 180 psi or higher, cooled, and discharged into a surge tank where it is combined with liquid pumped from the gas separator and compressor intercooler. Liquid and non-condensed gas from the surge tank are fed to the stabilizer.

The purpose of the stabilizer is to remove overhead all components lighter than C_4-hydrocarbons. The overhead stream usually consists of 80 mol per cent hydrogensulfide and 20 mol per cent light hydrocarbons. At typical operating conditions, the stabilizer reboiler is maintained at 200°F and the pressure and temperature at the top of the tower are 165 psi and 75°F, respectively. The stabilizer net overhead is disposed of as waste at the present time and the bottoms are fed to the debutanizer.

The purpose of the debutanizer is to strip off the C_4-hydrocarbons for recycle to the reaction system leaving a crude thiophene product. The tower operates at about 65 psi with a top temperature of 135°F and a reboiler temperature of 300°F. The overhead usually consists of 70 mol per cent normal butane, 20 mol per cent butenes, and 10 mol per cent normal butadiene The tower bottoms, containing about 75 mol per cent thiophene and 20 mol per cent carbon disulfide are cooled and discharged into crude thiophene storage tanks.

Periodically, crude thiophene is charged to a 300-gallon batch still and fractionated into carbon disulfide, thiophene, and still bottoms. The distillation yields about 70 weight per cent thiophene of over 99 per cent purity. Intermediate cuts are returned to crude thiophene storage for refractionation.

The process can be made completely continuous by substitution of two continuous fractionation columns for the existing batch still. Carbon disulfide would then be taken overhead in the first column and thiophene in the second column.

EQUIPMENT

The butane furnace consists of a helical pipe coil in a cylindrical refractory chamber. Heat is supplied by tangentially-located, venturi-type gas burners. A cylindrical refractory core confines the flue gas passage to provide high flue gas velocities, thus promoting heat transfer.

The sulfur and reactor furnaces consist of pipe coils placed in rectangular refractory chambers. Heat is supplied by multiple, Selas, radiant-type burners. The burners are spaced to give a uniform incidence of radiant heat on the entire coil. The stainless steel pipe coils are coated on the inside with a thin, bonded layer of aluminum to minimize corrosion by the sulfur hydrogen sulfide vapors.

The stabilizer is a 12-inch diameter column containing 15 feet of ½-inch berl saddle packing. Heat is supplied to the reboiler by a steam-heated finned-tube exchanger. Refrigeration is supplied to the finned-tube partial condenser by a brine stream externally cooled by a conventional ammonia refrigeration system.

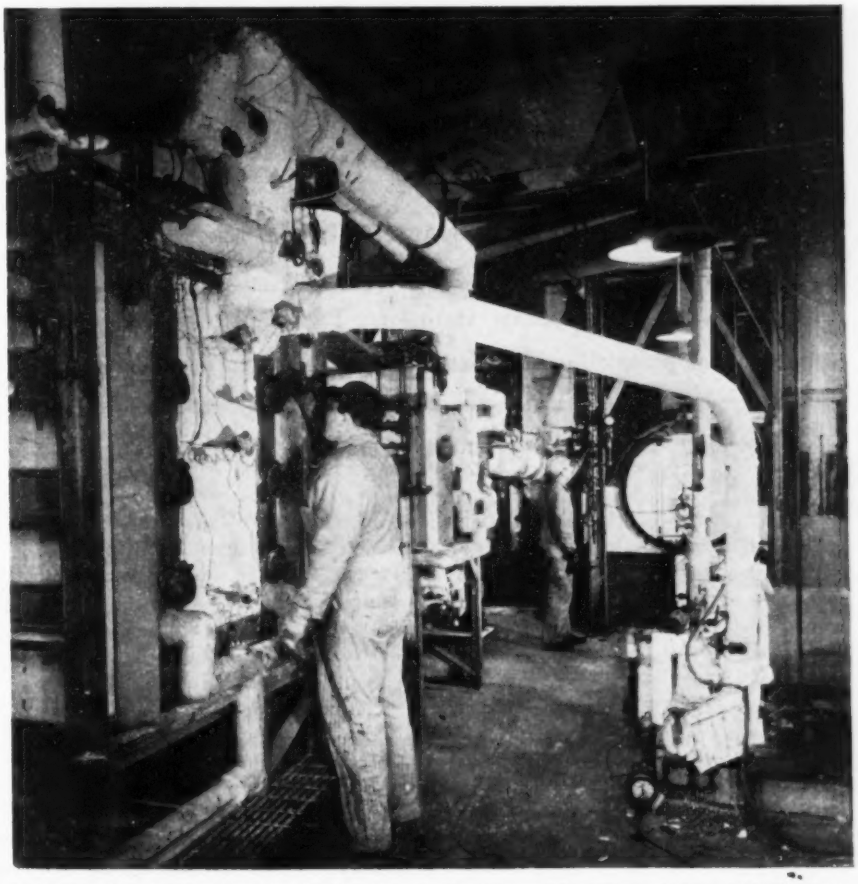
The debutanizer is a 10-inch diameter column containing 19 feet of ½-inch berl saddle packing. The reboiler is similar to the stabilizer reboiler. The overhead is totally condensed in a water-cooled, finned-tube exchanger and reflux is pumped back to the top of the column.

The batch still consists of a 12-inch diameter column and a gas-fired still pot. The column is packed to a height of 15 feet with ½-inch berl saddles. The overhead is condensed in a water-cooled finned-tube condenser and reflux is pumped back to the top of the column. The various fractions are collected in separate run-down tanks.

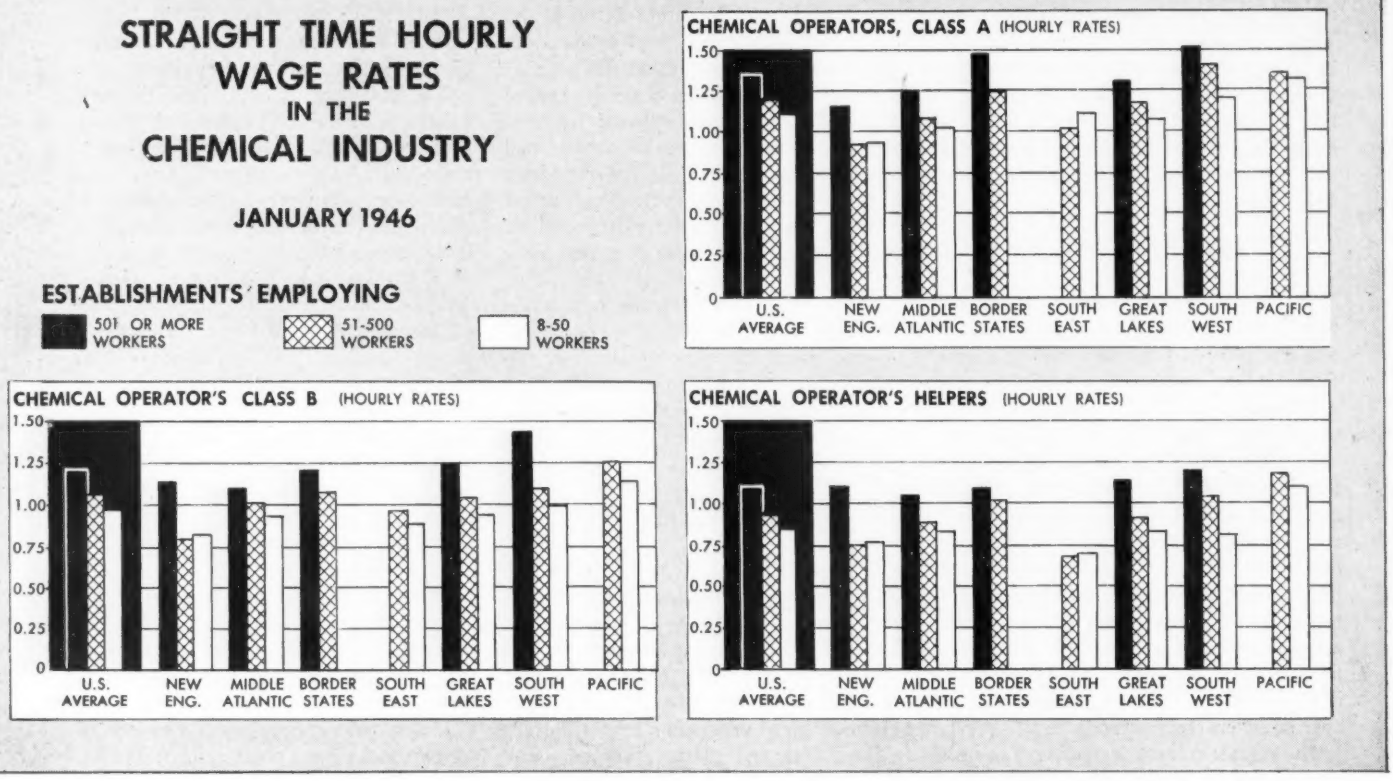
The remaining equipment consists of conventional pumps, compressor and tanks. Instruments are provided for recording and controlling flow rates, liquid levels, temperatures, and pressures at critical points throughout the plant.

The thiophene produced in the plant

(*Turn to page 620*)



Molten sulfur is vaporized in the furnace at the left. After adding butane, thiophene is formed in the center furnace, passing to the vertical quencher in the center. The batch still at the right serves for the final purification after removal of the low-boiling components.



Hourly Wages in the Chemical Industry, 1946

by DONALD L. HELM
Bureau of Labor Statistics
U. S. Department of Labor

REGIONAL AS WELL AS NATIONAL INDICES of wage differentials in the U. S. chemical industry are provided in this special study recently completed by the Bureau of Labor Statistics. To obtain their data, Bureau representatives personally visited some 255 establishments manufacturing a selected group of chemicals. In addition to wages, their report covers vacations, sick leave, insurance and retirement pension plans.

PLANT employees in the industrial chemical industry averaged $1.14 an hour in January, 1946, exclusive of premium pay for overtime and shift differentials.* About half of the 83,000 plant workers earned between $1.00 and $1.30 an hour. The plant workers in the Southeast section of the country earned 79 cents an hour on the average while the workers in the Pacific region averaged $1.22.

Maintenance workers at the higher skill levels received higher wage rates than other jobs studied. Average rates of workers in the 5 key maintenance occupations surveyed, ranged from $1.33 for carpenters to $1.47 for lead burners. Since chemical manufacture requires a relatively high ratio of equipment to workers, the industry employs a high proportion of maintenance workers.

Relatively high rates were also paid working foremen ($1.33), compressors ($1.32) and the important group of Class A chemical operators ($1.30 an hour). Occupational wage rates for the relatively few women workers ranged from an average of $1.06 for stock clerks to 77 cents an hour for filling-machine tenders.

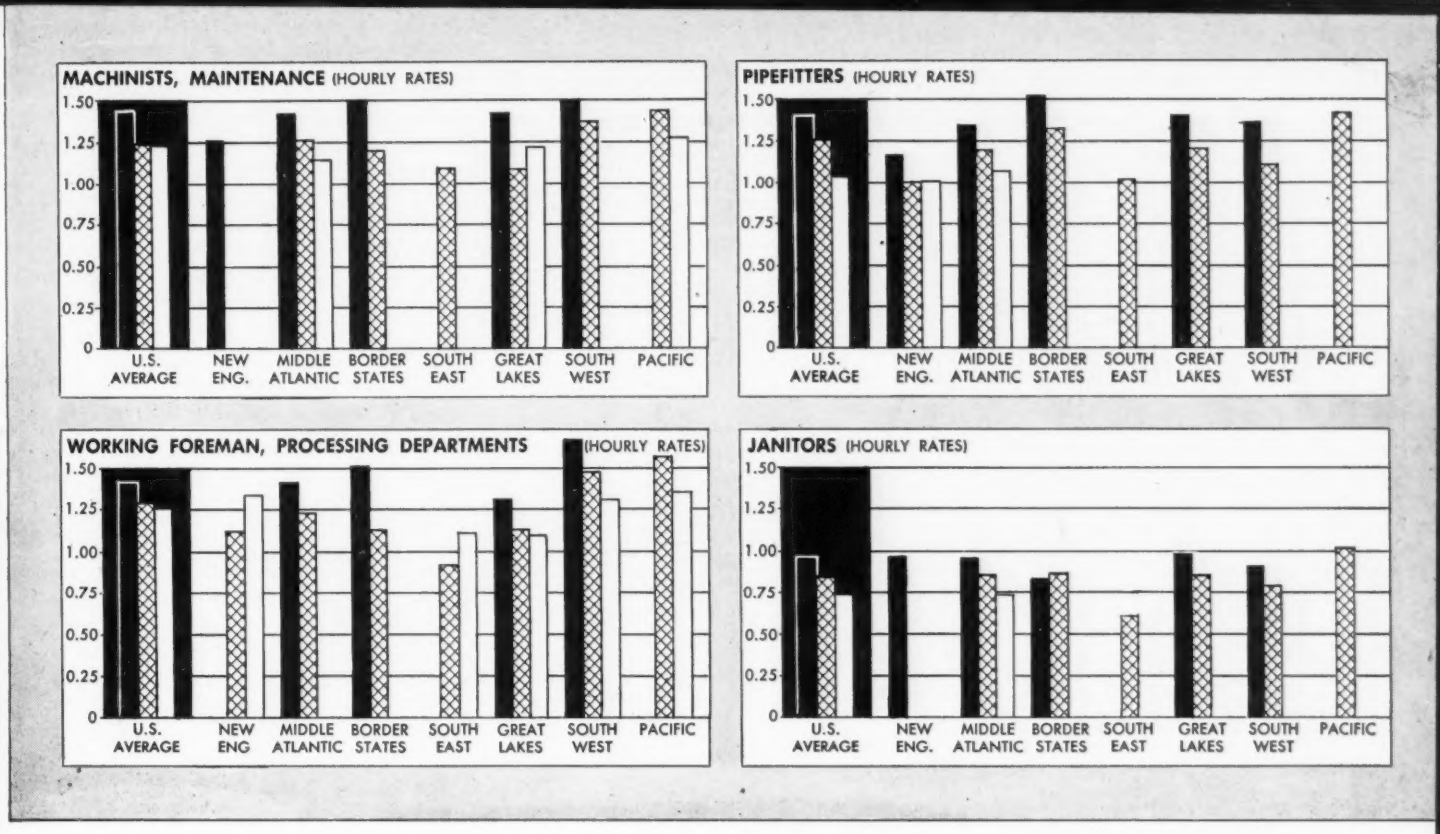
These facts were part of the findings made by the Bureau of Labor Statistics in a study of the wage structure of establishments manufacturing a selected group of chemicals. The products included in the study were tanning materials, dyestuffs, mordants, assistants, sizes, primary and finished coal tar products, bone black, carbon black, lamp black, acids, alcohols, ammonia, alkalis and salts, carbon tetrachloride, ethylene glycol, formaldehyde and citral.

In January 1946, over 400 establishments with 8 or more workers were primarily engaged in manufacturing the products covered by the study. The Bureau representatives visited about three-fifths of these establishments which accounted for two-thirds of the industry's workers. Data were obtained from the payrolls and other basic records of these plants.

PACIFIC COAST HIGHEST

Wage levels were lowest in the Southeast and highest in the Pacific region. The average entrance and job rates varied by about 75 percent between these regions, whereas average hourly earnings of all plant workers varied by more than 50

* Latest available data on average hourly earnings in the chemical industry is that for November, 1946, which indicates a 17% increase over January, 1946, the month in which the Bureau's special study was made.



percent. Straight-time earnings of all plant workers in the Great Lakes and Southwest were slightly above, and Middle Atlantic and New England wages below, the national average. In the Border States average hourly earnings were near Pacific levels, but minimum entrance and job rates were relatively low. The states included in each region are given in Table 1.

Comparisons of earnings of individual plant workers between the different regions show that 1 out of 3 workers in the Southeast earned less than 65 cents an hour, in contrast with 1 out of 40 in the Southwest and less than 1 out of 1,000 in the Pacific region. There were notable concentrations of workers earning $1.50 or more in the Border and Southwest regions.

For important groups such as chemical operators and maintenance workers, the highest and lowest regional averages differed in the regions by 30 to 45 percent. The widest spread in rates, 90 percent or more, occurred for autoclave operators, drum fillers, Class B evaporator men, and filling-machine tenders.

LARGE PLANTS PAY MORE

The tendency to higher wage levels in large rather than in small establishments was well defined. (See Table 2.)

A special analysis indicated that wage levels in plants employing over 500 workers averaged about 15 percent more for comparable jobs than in establishments with 51 to 500 workers and about one-fourth more than in plants with 8 to 50 employees. About the same ratios held in each of the 3 regions where the industry is most heavily concentrated. Job by job, on an industry-wide basis, average wage rates in the largest plants were 7 to 50 percent higher than in the smallest establishments. The difference in favor of medium-sized establishments as compared with smaller plants varied from 1 to 39 percent. In a few cases average rates were lower in medium than in smaller plants.

Apparently because a number of the biggest chemical establishments were in communities of less than 100,000, wages averaged more in those areas than in larger communities. The wage structure of the industry was thus different from that of many other industries, where wages tend to be higher in large than in small communities.

Nationally, rates for comparable jobs

TABLE 1

PERCENTAGE DISTRIBUTION OF PLANT WORKERS IN CHEMICAL ESTABLISHMENTS BY STRAIGHT-TIME AVERAGE HOURLY EARNINGS[1] JANUARY 1946

Item	*United States*[2]	*New England*	*Middle Atlantic*	*Border States*	*South-east*	*Great Lakes*	*South-west*	*Pacific*
Over-all average hourly earnings[1]	$1.14	$1.03	$1.11	$1.20	$0.79	$1.16	$1.15	$1.22
Total workers:								
Number	83,114	1,625	30,006	13,803	1,994	21,352	8,068	4,346
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average hourly earnings[1] (in cents)								
Under 50.0	[3]	0.1	[3]	....	0.1	....	....	....
50.0– 54.9	0.2	.2	[3]	....	5.7	[3]	....	[3]
55.0– 59.9	.3	1.2	0.1	0.2	10.6	[3]	[3]	....
60.0– 64.9	1.0	.7	.4	.4	17.3	0.4	2.5	[3]
65.0– 69.9	1.0	3.8	.4	.8	7.9	.7	2.3	....
70.0– 74.9	2.2	4.2	1.1	1.3	14.8	2.1	5.3	0.2
75.0– 79.9	2.2	7.1	1.8	2.2	3.7	2.2	3.1	.2
80.0– 84.9	3.0	6.7	3.9	2.3	6.2	1.7	4.2	.4
85.0– 89.9	4.3	4.0	5.4	4.5	3.9	4.0	2.5	1.5
90.0– 94.9	5.1	4.2	5.4	6.8	5.3	3.0	8.7	1.4
95.0– 99.9	7.6	3.1	8.3	10.3	3.4	7.8	5.5	2.2
100.0–104.9	7.7	13.1	9.5	6.2	3.1	5.9	4.9	13.1
105.0–109.9	8.1	6.1	13.3	4.1	4.4	6.6	1.7	9.8
110.0–114.9	11.2	17.6	14.3	7.8	3.9	11.5	5.9	12.4
115.0–119.9	6.8	8.8	6.0	3.5	3.8	10.1	6.9	8.0
120.0–124.9	8.1	6.8	6.9	8.1	2.1	9.8	7.5	12.2
125.0–129.9	7.7	2.2	6.3	6.0	1.5	10.7	6.5	13.6
130.0–134.9	5.6	5.5	5.3	6.7	.8	6.4	3.5	3.8
135.0–139.9	4.3	1.7	4.7	3.5	.3	4.5	4.8	4.5
140.0–144.9	3.1	.2	1.2	2.0	.2	5.4	7.7	2.7
145.0–149.9	2.3	1.1	2.4	2.5	.1	1.1	2.5	6.7
150.0–159.9	5.4	.6	2.0	14.0	.2	4.4	9.4	4.1
160.0–169.9	1.3	....	.9	1.9	.4	.7	3.9	.8
170.0–179.9	1.2	.3	.2	4.5	.2	.7	.7	1.7
180.0–189.9	.1	.1	.1	.1	.1	.2	[3]	.2
190.0–199.9	.1	.1	.1	.2	....	.1	....	.2
200.0 and over	.1	.5	[3]	.1	....	....	....	.3

[1] Excludes premium pay for overtime and night work.
[2] Includes data for other regions in addition to those shown separately.
[3] Less than .05 of 1 percent.

New England—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.
Middle Atlantic—New Jersey, New York and Pennsylvania.
Border States—Delaware, District of Columbia, Kentucky, Maryland, Virginia and West Virginia.
Southeast—Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee.
Great Lakes—Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin.
Southwest—Arkansas, Louisiana, Oklahoma and Texas.
Pacific—California, Nevada, Oregon and Washington.

TABLE 2

AVERAGE HOURLY EARNINGS[1] IN U. S. CHEMICAL ESTABLISHMENTS, JANUARY 1946

Occupation, Grade and Sex	Establishments With—501 or more Workers: Number of Workers	501 or more Workers: Average Hourly Rates	51–500 Workers: Number of Workers	51–500 Workers: Average Hourly Rates	8–50 Workers: Number of Workers	8–50 Workers: Average Hourly Rates
Men						
Absorbermen	201	$1.23	37	$1.19	22	$1.04
Autoclave operators	181	1.22	48	.93	4	[2]
Carboy fillers	140	1.09	67	.99	22	.92
Carpenters, maintenance	628	1.39	235	1.21	20	1.04
Chemical operators, class A	5,142	1.35	1,862	1.18	242	1.11
Chemical operators, class B	3,868	1.21	1,918	1.06	520	.97
Chemical operators' helpers	2,695	1.09	2,243	.93	333	.85
Driers, class A	220	1.29	116	1.13	...	....
Driers, class B	342	1.08	160	.95	29	.93
Drum fillers	476	1.12	217	.97	43	.75
Electric-cell men	247	1.27	96	1.22	25	1.08
Electric-cell repairmen and cleaners	279	1.24	106	1.08	3	[2]
Electricians, maintenance	838	1.43	345	1.29	23	1.27
Evaporator men, class A	227	1.28	154	1.18	18	[2]
Evaporator men, class B	112	1.24	68	1.02	14	[2]
Filling-machine tenders	176	1.11	378	.86	136	.95
Filterers, class A	254	1.22	104	1.18	14	[2]
Filterers, class B	259	1.15	192	1.01	2	[2]
Guards	624	1.13	229	.98	7	[2]
Janitors	1,067	.97	403	.85	37	.74
Kettlemen, class A	515	1.28	85	1.18	...	....
Kettlemen, class B	65	1.09	48	1.05	30	.84
Laboratory assistants	615	1.13	272	.93	31	.88
Lead burners	177	1.60	134	1.32	17	1.22
Machinists, maintenance	893	1.43	330	1.24	67	1.23
Millers, class A	103	1.25	100	1.14	5	[2]
Millers, class B	129	1.08	211	1.00	56	.72
Mixers, class A	196	1.25	138	1.15	36	1.17
Mixers, class B	231	1.11	207	.94	105	.94
Pipefitters	1,394	1.39	524	1.25	30	1.03
Pumpmen	344	1.21	170	1.06	36	.92
Stillmen, class A	484	1.33	162	1.14	40	1.11
Stillmen, class B	271	1.20	81	1.01	26	.98
Stock clerks	504	1.18	162	1.02	17	[2]
Truck drivers	685	1.18	390	1.05	142	1.08
Truckers, hand	450	1.00	335	.87	78	.72
Truckers, power	180	1.13	34	.90	6	[2]
Watchmen	436	.99	334	.83	91	.74
Working foremen, processing departments	322	1.41	308	1.28	168	1.25
Women						
Chemical operators' helpers	230	1.01	79	.91	3	[2]
Filling-machine tenders	77	.94	108	.68	24	.65
Janitors	122	.96	36	.78	8	[2]
Laboratory assistants	919	1.00	266	.80	20	.83

[1] Excludes premium pay for overtime and night work.
[2] Insufficient number of workers to justify presentation of an average.

averaged about one-twelfth higher in communities of less than 100,000 persons than in more populated areas. That proportion was surpassed in the Border States, where average wage levels in the small cities exceeded those in the larger communities by about one-fifth. On the other hand, the Middle Atlantic and Great Lakes regions showed little variation between large and small localities. New England alone showed a slight tendency toward higher earnings in the larger communities.

UNION 3% ABOVE NON-UNION

Average straight-time hourly earnings of union workers were frequently but not always higher than those of nonuion workers. The difference averaged about 3 percent; union workers averaged more than nonunion workers in the country as a whole in 7 out of 10 occupations studied. Union workers held the greatest advantage in New England in the Southwest, where their wage levels averaged about one-third and one-fourth, respectively, higher than those of nonunion workers. No large nonunion establishments were found in these regions. In contrast, in the Border States and Southeast, where several large plants were not unionized, earnings of nonunion workers averaged about 10 to 15 percent higher than those of union workers.

Since a substantial proportion of the plant labor forces performed maintenance work or other activities which are generally not paid on an incentive basis, and since the time cycles of chemical processes are frequently predetermined, almost all workers in the industry were paid on a time basis. However, in the limited number of jobs in which both methods of wage payment were common, employees paid on an incentive basis averaged about 3 percent more than time workers. The amount of variation, however, differed considerably from region to region. The differential was related in part to the higher wage level of some of the larger plants, where the majority of the industry's incentive workers were employed.

Although the average weekly hours in January 1946 were about 10 percent below the industry's wartime peak, premium overtime rates were still a significant source of worker income in about half of the establishments studied. In addition, partly because of the continuous nature of some of the operations, extra shift work paid for at premium rates was also important. The extent of premium pay for overtime work is roughly indicated by the scheduled weekly hours of first-shift workers, since all hours above 40 a week are generally paid for at premium rates.

About 55 percent of all establishments studied reported a scheduled week of 40 hours for men; two-thirds of the establishments with women plant workers reported similar hours. Proportionally more plants with over 500 workers reported a 40-hour week than did smaller establishments. A 48-hour schedule was operated by about three-tenths of the establishments employing men and by one-fifth of those employing women.

Roughly two-thirds of the plants operating extra shifts paid premium rates for such work. Extra payments amounted to 5 cents an hour or less in the majority of plants operating second shifts, while differentials for third-shift workers generally ranged from 5 to 10 cents an hour.

VACATIONS AND SICK LEAVE

Industrial chemical manufacturers ranked high among the nation's manufacturing industries in extending paid vacations and sick leave to plant workers as well as in maintaining retirement pension plans for all employees. The proportion of establishments granting vacations after one year of service (11 out of 12) was roughly the same for both plant and office workers. Four out of five plans gave plant workers one-week vacations, whereas more than two-thirds of the plans for office workers provided for a two-week period.

In contrast to most other manufacturing industries, the proportion of plants

(*Turn to page 711*)

TABLE 3

INSURANCE OR PENSION PLANS IN CHEMICAL ESTABLISHMENTS, JANUARY 1946

Type of Plan	Number of Establishments in[2]—United States	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Southwest	Pacific
Total establishments studied	255	22	78	23	13	43	33	34
Plant Workers								
Total establishments with insurance or pension plans[1]	189	12	57	20	9	30	29	26
Life insurance	164	7	50	19	9	27	28	20
Health insurance	116	7	37	11	4	18	15	21
Retirement pension	63	..	24	7	5	10	6	10
Other	46	6	13	10	..	14	..	..
No insurance or pension plan	66	10	21	3	4	13	4	8
Office Workers								
Total establishments with insurance or pension plans[1]	164	11	55	19	7	26	17	24
Life insurance	140	6	48	18	7	22	16	19
Health insurance	97	4	33	8	3	16	10	20
Retirement pension	60	..	25	7	5	9	5	9
Other	43	6	13	8	..	13	..	..
No insurance or pension plan	55	9	17	3	3	11	3	7
Information not available	7	..	..	1	2	3	..	1
No office workers employed	29	2	6	.	1	3	13	2

[1] Unduplicated total.
[2] See Table 1 for definition of regions.

Adapting Domestic Egg Albumin to Industrial Use

by FRANK S. LOMBARDO, Chemical Engineer
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DURING THE WAR, United States users were cut off from their principal source of technical egg albumin—China. Domestic egg albumin, unlike the Oriental product, varies greatly in quality and properties. Here is how one manufacturer, who uses an albumin sol as an adhesive, solved the problem through rigid laboratory control and proper mixing.

PRIOR to the war, the bulk of the technical egg albumin for industrial use was imported from China. The Chinese egg albumin, consistent both in properties and quality, was essentially a high grade product. It was obtainable at a comparatively low price and was packaged in air tight tin containers that could be adequately stored for indefinite periods of time.

Futile attempts were made by the crown industry, which had been using a blend of Chinese egg albumin and animal blood albumin as an adhesive in the assembly of crowns and the component cork discs, to replace albumin with a resin type adhesive. The available domestic egg albumins varied greatly in quality and properties and necessitated the introduction of rigid laboratory control, the design of adequate storage facilities, and the standardization of albumin sols. Due to the fact that very little, if anything, was to be found in the literature concerning the properties of the domestic technical albumin sols, an investigation of the properties of the available domestic technical albumins was found necessary before suggestions could be offered relative to better performance and standardization of the sols.

ALBUMIN SOLS

Egg white and blood serum are the principal sources of albumin. Both varieties of albumin are soluble in water as colloidal dispersions identified as albumin sols. The gelation of albumin sols when heated is an irreversible reaction resulting in a water resistant adhesive. Egg albumin is almost neutral and exhibits its minimum solubility at the isoelectric point. Egg albumin has an isoelectric point of 4.84-4.90 pH and a molecular weight range of 40,500 to 46,000.

The inconsistency in the composition and quality of domestic egg albumin, aside from the possible dearth of sound engineering practice in the separation, purification, and dehydration operations, may be due to the lack of consideration for the biological aspects; it has been observed that the environment of the animal and the producing period affect the chemical composition of the eggs, i.e. the water content in the white of eggs increases during the summer months.

Since albumin from the "Orient" will not be forthcoming for a long time, it is necessary for our domestic egg albumin industry to introduce a scientific approach to the problem of producing albumin that would be compatible to the formerly imported product. The expenditure necessary for research in the albumin industry is warranted by the million or more dollars of albumin that American industry consumes yearly.

PROPERTIES AND BEHAVIOR

Laboratory tests were conducted to determine the range of viscosity variations of domestic egg albumin sols from various sources, the variation of albumin viscosity with age, the variation of albumin viscosity with temperature, and the range of viscosity which would render the best performance.

Samples of domestic egg albumin were taken from various sources and the viscosity determined with a standard A.S.T.M. brass cup. As the data of Table I indicate, the viscosity varied considerably for batches from the same sources, as had been anticipated.

In order to determine the variation of the albumin viscosity with age, two separate types of tests were conducted in the laboratory. In one test, the albumin was stored at room temperature (approx. 70°F.) and the viscosity recorded periodically. The data recorded for one sample, which was typical of the behavior of several others, is represented by the curve on Graph 1. It will be noted that the viscosity increases almost proportionately with time, indicating that the albumin is gradually solidifying and approaching the gelation state.

TABLE I — VISCOSITIES OF DOMESTIC EGG ALBUMIN AT 23-24 DEG. C.

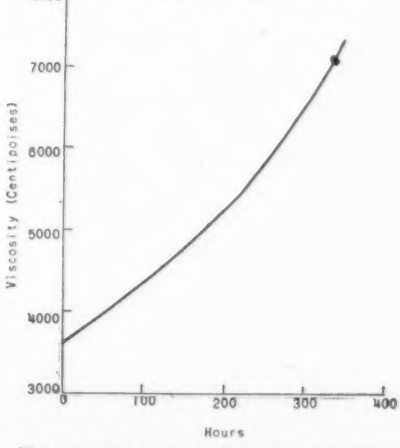
Source	*Sample No.*	*Viscosity (Seconds)*
Company A	EA1	28.8
Company A	EA2	19.4
Company A	EA3	22.4
Company A	EA4	13.3
Company A	EA5	18.7
Company B	EA6	24.4
Company B	EA7	21.2
Company B	EA8	27.5
Company B	EA9	27.7
Company B	EA10	17.6
Company C	EA11	9.9
Company C	EA12	29.9
Company C	EA13	29.6
Company C	EA14	12.3
Company C	EA15	23.0
Company D	EA16	24.8
Company D	EA17	23.1
Company D	EA18	18.4
Company D	EA19	29.2
Company D	EA20	16.1

The other test was essentially the same, except that the albumin was stored in a refrigerator at a temperature range of 48°-50°F., the viscosity being recorded periodically. The viscosity in this case was found to remain constant for more than a week.

On Graph 2, a variation of albumin viscosity with temperature was plotted. The curves follow a definite trend indicating that various sources of albumin will behave similarly as the temperature is increased.

In order to determine the range of

FIG. 1 - VARIATION OF ALBUMIN VISCOSITY WITH AGE
(Stored at Room Temperature 70°F.)



Viscosity data obtained with a Brookfield Synchrolectric Viscosimeter, standard model.

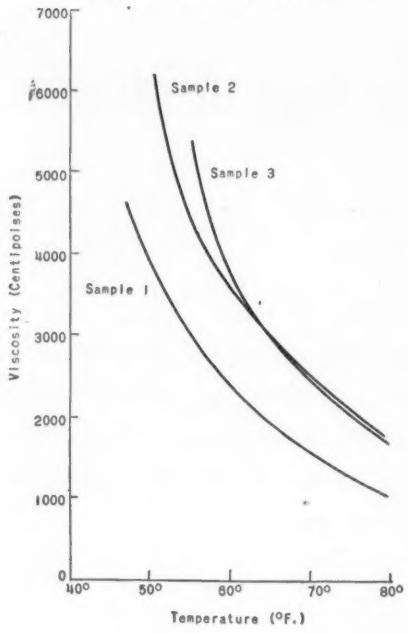
viscosity which would give the best performance, and to determine the minimum viscosity at which the albumin would give satisfactory performance, trial runs in the plant were made and a minimum viscosity range established.

LABORATORY CONTROL

The problem of obtaining suitable performance from domestic egg albumin, where it is to used in the manufacture of a product on a large scale line production, calls or rigid control of the purchases of albumin by the control laboratory. An effective system for laboratory control which the author established for the Mundet Cork Corp., one of the leading consumers of albumin as an adhesive in crown assemblies, is as follows:

Samples of technical albumin are submitted to the laboratory for approval. If the physical properties are satisactory, extensive tests are made both in the laboratory and in the plant relative to chemical properties and adhesive qualities. The chemist in charge of the chemical control of the plant operations then reports to the purchasing department, either suggesting the purchase of a week's supply in order that he may make further observances under actual operating conditions, or rejecting the batches entirely. (Batches often run from 50,000 to 75,000 pounds.) As the shipments of albumin are received, each barrel is sampled by the laboratory and tests are

FIG. 2 - VARIATION OF ALBUMIN VISCOSITY WITH TEMPERATURE



made to make certain that the product meets laboratory specifications. The mixing of the albumin sols in the plant, comprising 200 to 300 pounds of albumin per mix, is closely supervised by the laboratory so that no deviation is made from the formula specified.

The system for laboratory control also calls for the adjustment of the albumin mix to the established minimum viscosity range, as mentioned earlier. This is done so that the albumin feed apparatus on the assembly equipment will require a minimum of adjustment and attention. The plant chemist determines the viscosity in the mixing room, and by reference to a chart made up for the purpose, adds the proper amount of water to the sol to bring it into the desired viscosity range.

STORAGE AND HANDLING

Engineering design for storage is governed by the laboratory test data represented by Graphs 1 and 2, which indicate that the viscosity of the albumins increases with age at room temperature and with increase in temperature. Laboratory tests also indicated that if stored at a temperature below 50°F., albumin will not change in viscosity for long periods of time, nor will any noticeable decomposition or bacteriological action occur. Therefore, the installation of refrigerated facilities for storage and mixing of albumin sols was found to be of the utmost importance in maintaining the solution at the desired consistency until ready for use. Standardization of the albumin sols has resulted in a predictable performance of the albumin sol used, and this, along with decreased spoilage, has led to a generally higher efficiency of plant operation.

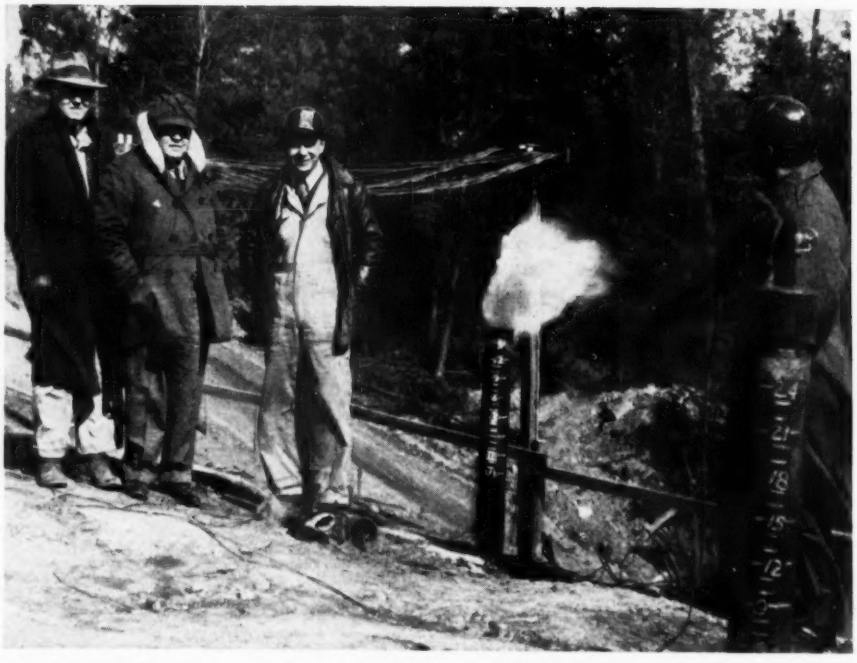
VAPOR PHASE MINING

AN experiment which may have great significance for all industry, and chemical industry in particular, began on January 21 of this year when the Alabama Power Co. started a fire in one of its coal mines near Gorgas, about 40 miles from Birmingham, Ala. The fire is still burning, and its purpose is to determine whether underground gasification of coal can be developed on an economical basis.

In addition to providing an alternate method of "mining", underground gasification may be the long-sought-for means of recovering the energy content of coal which is deposited in seams too thin to mine by conventional means.

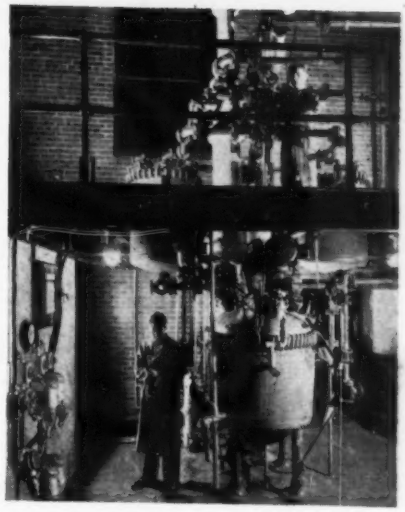
The heating value of the gas initially being produced in the Alabama experiment is about 250 Btu/1,000 cu. ft., but the company has hopes that this can eventually be raised to 500-600 Btu.

Observers say it is still too early to draw conclusions about the economics of the process or its value as a source of chemicals. Although this is the first experiment of its type in the United States, several large plants in Russia are reported to have operated for several years on fuel gas made by similar means.



Gas from one of the vents is ignited in the first U. S. experiment in underground gasification of coal. The coal was ignited in the seam wth an incendiary bomb, and partial combustion is maintained by alternately blowing air and steam through holes drilled in the seam. Tests are being planned in which pure oxygen will be substituted for air, so as to permit a continuous "blow."

What is a PILOT PLANT For?



EDITORIAL STAFF REPORT

DEVELOPMENT ENGINEERS FREQUENTLY PROTEST to the Editors that the pilot plants they operate are not properly utilized for what they say is the basic purpose of a pilot plant—that of developing plant design and operating information. While the views of these men are perhaps only one side of the story, they do present some very rational arguments.

THE pilot plant is a widely employed step in the development of new chemical processes and products. Hundreds of new compounds come into commercial production each year, and the majority of them pass through, at some time in their growth, a stage known as the pilot plant. Yet, despite its universal service, there seems to be a lot of confusion as to just what a pilot plant is and what it should do.

Few, if any, real pilot plants can be built and operated for expenditures lower than five figures. Many cases run into six figures, and a few even run into the millions. The disbursement of funds of this magnitude requires two things—a sound basis for the venture and a good expectancy of return on the investment—for the profit motive in business does not countenance the idea of putting out money unless it will bring in a return.

Thus the building of the pilot plant itself must be predicated on sound evidence that the venture will be profitable in the end. Presumably it has been established by laboratory and market research that the product will find certain specific uses; that some suitable amount of it can be sold at a price that is profitable; and, that the process itself will work in a manner that assures the anticipated profits.

But, with all this assurance ahead of the pilot plant, why do you need it? The development engineer says that the cost of a pilot plant is justified by the reduction in plant investment that it produces, and by the saving in operating cost of the final commercial plant that results. Perhaps a full-scale commercial plant could be designed from the laboratory data, but this entails two risks—the risk of overlooking vital process factors that did not come to light on a laboratory scale, and the risk of greatly overdesigning the plant. The first entails the possible expenditure of unknown amounts of additional capital on a large scale to rectify any omissions. The second would burden the project with an unnecessarily heavy overhead expense, and would needlessly tie up capital.

For these reasons the development engineer feels that the pilot plant should first be operated to serve its function in plant design. If samples, or production, can be obtained from the pilot plant after it has fulfilled this purpose, that is all right with him. But, if production is desired before the pilot plant's basic job is done then he feels that diverting it to these ends may jeopardize the ultimate efficiency of the commercial plant and hence the full realization of the market volume and profits. The other diversions often proposed—research investigations and operator training—are likewise viewed with alarm, for management often becomes impatient for profits and only so much time can justly be allotted to the pilot plant phase of the development.

HOW THE PILOT PLANT SHOULD BE RUN

The development engineers go on to explain how the pilot plant provides essential information for the design of an efficient plant. There are two general types of knowledge needed—chemical and mechanical. The specification of all the chemical process factors will define what conditions must obtain if the desired product is to be produced. Designation of all the mechanical factors defines how the plant must be built in order to permit the attainment of the specified chemical conditions.

In both of these categories it is expected that the laboratory research will have provided some sound basic concepts and most of the more general requirements such as temperatures, pressures, flow quantities, etc. The pilot plant goes beyond these in specifying greater detail and in defining conditions that could not be simulated in the laboratory.

The chemical problems are chiefly—quality, yield and control. Quality factors include the stipulation of stream compositions at each point in the process. This cannot be a mere academic specification of maximum purities throughout; it must be a practical set of conditions determined by actual operation. It may involve specifications on the operation of various reaction and separation steps, materials of construction and the dangers of adverse physical conditions. Yield considerations involve the adverse effects of construction materials that cause side reactions or decomposition; the losses resulting from starting and stopping the operation, purging the system and cleaning equipment. Practical means must be devised for minimizing handling losses and of raising recovery efficiencies.

Problems of control are particularly matters for the pilot plant. Often a considerable development is needed to get a temperamental process to work as well at the hands of ordinary operating labor as it did under the guidance of a skilled research chemist.

Mechanical problems are an even greater jump from the laboratory. First, many types of process equipment suitable for plant operation have no adequate prototypes in the laboratory so all the development on these must be done in the pilot plant. Second, even standard types of equipment need many special refinements—location of clean-out points; specification of the method of fabrication, materials or construction, and mode of assembly; and special connections for draining, purging, etc. Third, auxiliary apparatus for heating, evacuating, compressing, circulating and such operations vary greatly between the laboratory and the plant. Many ingenious expedients that are so useful in the lab are unsuited to plant work and practical plant devices must be worked out. And last, many factors that make for an efficient plant layout from the standpoint of waste disposal, labor, control and hazards become evident only during actual pilot plant work.

Thus the development engineer makes his case for confining pilot plant work to the development of design information.

AEROSOLS SHOOT FOR MASS MARKET

With Low Pressure Propellants, Cheap Containers

by LYLE D. GOODHUE, FREDERIK S. SCHULTZ, and PAUL H. WILKINS
Airosol Inc.
Neodesha, Kansas

AEROSOLS HAVE ALREADY CAPTURED a large share of the insecticidal spray market even though present formulations require the use of high cost containers. The advent of new low pressure aerosols, which permit cheaper packaging, presages a tremendous increase in total aerosol sales.

ALTHOUGH the liquefied gas insecticidal aerosol was conceived shortly after the introduction of Freon—as a commercial refrigerant—actual use of this non-toxic, non-flammable gas as a propellant for insecticides was not developed (1,2,3,4) until just before the U. S. entered the war. But this method of dispensing insecticides proved to be so well adapted for military use that by the end of the war the Army and Navy had purchased more than 40 million 1-lb. aerosols. Approximately 30 million of these were used overseas to control disease-carrying pests.

By the end of the war the aerosol bomb had received so much publicity that a large civilian market was already waiting for those engaged in the manufacture of aerosol dispensers. This resulted in a substantial sale of the product in the fall of 1945 and even through the following winter season.

The commercial aspects of the aerosol bomb have been thoroughly discussed by Markwood (5) and it is well established that the aerosol has gained a permanent place in the insecticide field. Of major significance is the more recent development of low pressure type bombs which are expected to capture a substantial share of the insecticidal spray business.

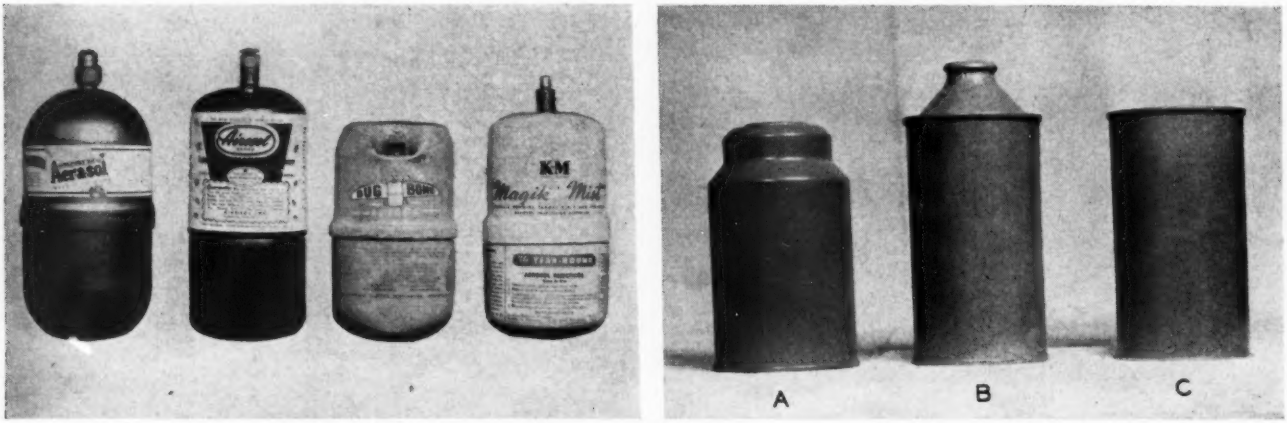
HIGH PRESSURE TYPES

The aerosol package on the market today is very little different from that used by the armed forces during the War. The type of valve and the color of the container are the principal changes. Practically the same dies are now in use that were found most suitable for the production of the wartime container. These are a familiar sight almost everywhere insecticides are sold. (Fig. 1)

Before the end of hostilities the Navy requested a specification for a container and the result was the writing and adopting of ICC-9 for a refillable container employing a nonflammable propellant. However, for civilian consumption it appeared more practical to use a non-refillable container which did not require the heavy gauge metal specified by ICC-9. To meet these requirements ICC-40 was drawn and adopted. All 1-lb. aerosol bombs now on the market are regulated by one of these specifications. The safety requirements are such that no hazard will result in their use by the public.

The valves now in use are either operated by a screw or a push button. The type of valve is not specified by the ICC regulations and it has been subject to much variation among the different manufacturers. Attempts to provide an easily operated valve have led to considerable trouble with leakage and other operative difficulties, and in the rush to supply the demand for the aerosol dispenser not enough time for experimentation was available. Many containers were marketed before their worth had been properly appraised.

The manufacture of these containers under the ICC specifications is largely a hand process. As many as 60 hand operations are required before the package is ready to be shipped. This method of manufacture means a relatively high cost container. At the present time the



Some of the high pressure aerosol dispensers now on the market are pictured at left. Right: low pressure containers. A. Drawn can with no longitudinal seam and concave bottom; B. Three piece can with concave ends. Early large-scale production is scheduled. As many as 60 hand operations are required in the manufacture of high-pressure bombs. Newer designs are cheaper, and easily lithographed.

cost of the container to the consumer is approximately equal to the cost of the insecticide contained in it.

The insecticide in these bombs found on the shelves of many stores today is either identical, or very similar, to that used by the military. These formulations were thoroughly tested before they were recommended to the Army and Navy and their practical use has been proved. However these military formulas do have some shortcomings such as unpleasant odor and the paint removing properties of some of the solvents. Also, they were formulated principally for flying insects.

The propellant used to disperse the insecticide is dichlorodifluoromethane (Freon-12). This liquefied gas exerts a vapor pressure of approximately 85 psi at room temperature which necessitates a substantial container.

CHEAPER CONTAINERS

Numerous experiments have shown that a great reduction in pressure can be made without reducing the insecticidal effectiveness of an aerosol-producing solution. At a lower pressure the necessity for a strong container becomes less and at a pressure below 25 psi at 70°F. a specified ICC container is no longer required.

In Tariff No. 4 of the Interstate Commerce Commission paragraph 300 defines a liquefied or compressed gas as one exerting a total pressure exceeding 25 psi (gauge) at 70°F. This pressure is barely enough to produce an aerosol but this difficulty can be overcome by a cleverly designed dispensing device and special choice of propellants. Very effective formulations adaptable to this package have been developed with the limitation that they should be operated at or above, ordinary room temperature for best results.

Manufacturers interested in the production of low pressure aerosols together with the Compressed Gas Manufacturers' Association are considering a specification for a light container to hold up to 40 psi at 70°F. This increase of pressure will assure the success of the low pressure aerosol and in turn the entire aerosol business.

EASILY MADE

The different can companies have foreseen the use of containers similar to those now used for beer and have made considerable progress in the development of an aerosol package. One company is proposing a three-piece tin can, with concave ends, equipped with a dispensing valve and lithographed with the label of the particular aerosol manufacturers. These cans will be fabricated from tin plate but they are not yet available in sufficient numbers for large scale marketing. The size suggested will safely hold 12 ounces by weight of a low pressure aerosol solution when Freon is used as a propellant. If heat causes a rise in internal pressure to approximately 150 psi the concave ends invert and rupture the seam. This rupture acts as a safety device to prevent an excessive rise in pressures. The three-piece container lends itself well to good lithographing because the printing is done in the flat before fabrication. The concave ends also facilitate packing and storage. Too, tin plate has an advantage in preventing corrosion although some cases of catalytic decomposition of aerosol solutions have occurred in tin containers.

Thousands of specially reared flies are necessary for evaluation of new aerosol formulas.

Formulations must be carefully prepared if biological testing is to be meaningful.

Another company has developed a drawn container especially for insecticidal aerosols which does not have a longitudinal seam. The bottom of this container is concave, similar to the one mentioned previously, and the top is of pleasing design as shown in the accompanying photograph. (Fig. 2) These containers are made of 28 ga. sheet steel and can be furnished to the aerosol manufacturer complete with a baked enamel coating on both the inside and outside and lithographed with the label desired. The top of the can has a 1-inch hole bounded by a roll of metal to accommodate a special attachment for the valve designed by each manufacturer. No attempt is made by this can company to provide a valve. The advantages of this container are strength, because no longitudinal seam is used; a convenient method of sealing; and the design is attractive.

An ordinary beer can with a valve in a crown cap or similar attachment has been proposed, but this does not appear to meet with much favor because it resembles a beer can too closely. Disapproval by the brewers has discouraged the use of such a container.

At low pressures, such as those now possible with the recently perfected aerosol formulations, the use of a glass container has some possibilities. The strength of a glass container can be adequate, but some means is necessary to prevent shattering when the container is broken. Coated bottles are a distinct possibility and should not be overlooked for certain self-propelled applications.

Another means of reducing the cost is the use of a small, inexpensive container, which does not exceed four fluid ounces capacity. Below this capacity an ICC specified container is not necessary unless it contains a poisonous liquid or gas. One large food organization has worked out a novel package which employs the use of a 3½ oz. cartridge in an outside container with a trigger valve. The cartridge can be replaced by another after it is exhausted. Other concerns are marketing a container of this capacity with a small, inexpensive valve directly attached. The retail price of these small units now on the market is excessive and this package does not appear to be practical unless it is intended for some special purpose.

The only other attempt to produce an inexpensive aerosol package has been by the use of the soda siphon cartridge. This was used by Great Britain during the recent war and is still being marketed to some extent in this country. The small amount of material it contains greatly limits its usefulness and the actual cost per unit of insecticide is considerably greater than when packaged in larger containers.

LOW PRESSURE FORMULATIONS

The principal requirements in formulating a low pressure aersol solution are choice of propellant and low nonvolatile content. These are necessary because less liquefied gas energy is available to reduce the insecticide to the

proper particle size. The low non-volatile content is a disadvantage for sales purposes because the inert ingredient statement appears large. However, any manufacturer attempting to introduce a large amount of oil to increase the percentage of active ingredients will reduce the effectiveness of the completed solution. Since no one liquefied gas with the required pressure is known such formulations must contain a mixture of two or more gases. The ratio should be adjusted to obtain the greatest amount of the high pressure gas without exceeding the specified limits.

Aerosols have proved useful not only in the home but also show promise in combatting some types of agricultural pests. Here an entomologist conducts lettuce insect tests.

Obviously it is necessary to use highly effective insecticides, such as pyrethrum, DDT, chlordane and others which do not increase the non-volatile content of the aerosol beyond the effective limit. In a low pressure aerosol this limit is close to 10%. Less effective insecticides which will require more than this amount are not practical.

In any aerosol formulation no solvents active on rubber or paint should be used. The elimination of these solvents will reduce the difficulties usually encountered with rubber valve parts and the troublesome effect on the painted container. In a low pressure formulation which employs considerable Freon-11 no auxiliary solvent is necessary.

Another desirable property is a slow increase in vapor pressure with temperature. A reduced rate of increase can be obtained by adding certain volatile solvents with a flat vapor pressure-temperature curve.

This laboratory has studied many low pressure aerosol formulations, with pressures as low as 25 psi at 70°F. These have been tested against flies by a method to be published shortly. In comparison to the Army Formula as a standard these low pressure aerosols give a more rapid knockdown and a higher kill. Tests on roaches give similar comparative results.

The manufacturing process which consists of packaging insecticidal aerosols is much more simple with the low pressure container. These containers can be obtained fully lithographed and ready to fill which eliminates most of the previously required operations. This is, of course, a great advantage to manufacturers and will greatly reduce the cost of an aerosol unit. It will, however, lead to more competition since considerably less investment will be required for a concern to manufacture such a product. Price cutting and poor formulations will result in chaotic conditions until a stabilized program can be worked out. Two major considerations must be kept in mind by all reputable manufacturers. The use of flammable materials or toxic propellants in aerosol formulations cannot be countenanced. Toxic propellants present an obvious danger, and flammable liquids should not be packaged in any type of an aerosol because of the great hazard in shipping and in ultimate use by the general public.

MARKET PROSPECTS

A number of estimates have been made of the potential market for both the high and the low pressure aerosol units. There appears to be a market for from 7 to 10 million of the high pressure units, and with the low pressure package (which will retail for approximately half the price,) this figure may increase to 25 or 50 million. These estimates are made on the basis of a package containing at least 12 ounces by weight. Some companies are already advertising low pressure aerosol packages at prices ranging from $1.00 to nearly $1.75. Many of these companies are expecting an ample supply of propellants late this year, and will attempt to be ready for the market in 1948.

Anyone familiar with the liquefied gas method can suggest many other applications besides insecticides. Dietz (6), for example, suggests the application of cosmetics, germicides, pharmaceuticals and agricultural chemicals in aerosol form. Many others have been proposed by those familiar with the aerosol principle. Some of these can be applied more advantageously by a low pressure propellant but some are dispersed better by a high pressure.

Initially, because of their high retail cost, there were many who discounted the size of the civilian market for aerosols. In general, most entomologists realized the potentialities of the insecticidal aerosol but they were disturbed by the unit price even though they were fully aware that this material is a highly concentrated insecticide. Nevertheless, even if the low pressure aerosol were never introduced the high pressure package would always command a certain market. This method of applying insecticides is a satisfaction to the "button-pushing" public.

With the advent of the lower pressure package, and the accompanying reduction in retail price, the continuing demand for the aerosol is more than ever a certainty. The high effectiveness, convenience, and ease of operation, are some of the factors that establish such a product with the consuming public.

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Aerosols gained early consumer acceptance. It is expected that sales will soon reach a level of about 50 million units annually.

SELL and PRODUCE Abroad for PROFIT

by A. ROOSEBOOM, Consulting Chemical Engineer,
New York, N. Y.

WHEN THE HALCYON DAYS OF THE SELLER'S MARKET are past, foreign sales may swing the ledger to the profit side. But export of technology, to build foreign plants for the production of products which cannot be exported, may be a profitable angle for American firms to consider.

A WEALTH of natural resources and an intensive development of industry has given the United States a higher standard of living than any other nation. This, together with the relatively large population of this country, supports a market for goods which is naturally of prime importance to the manufacturer. The export market takes second place and is looked upon, generally speaking, as an outlet only for whatever domestic buyers cannot absorb.

Today the chemical maker's attention is more than ever fastened upon the ravening domestic demand, which, in the face of raw material shortages, cannot be satisfied even by his best efforts.

Export business is not popular. To the average producer it means a lot of trouble and little profit. Many companies—especially the smaller ones—are satisfied to let their foreign sales be handled by export houses.

A few, however, are looking beyond next week to the time when home demands are satisfied, "over-production" becomes a problem, and export business spells the difference between loss and profit. The government, too, recognizes the desirability of increasing international trade as a means of bolstering world economy and is trying, through the Department of Commerce, to push both exports and imports.

The hard fact remains, however, that under today's peculiar circumstances this is not easy. Chief among the problems is the inability of foreign countries to pay for our goods, either in dollars or in return goods. Support in overcoming this obstacle is the primary purpose of the Import-Export Bank; but no matter what credits are granted other nations, our goods will ultimately have to be paid for by return of goods or services.

ONE-WAY STREET

But this fact brings us up against a more serious and fundamental problem: There are relatively few goods or services from abroad that we can use. Except for a few raw materials—certain minerals and tropical agricultural products—our needs from the rest of the world are confined to luxury items, the manufacture of which requires a great deal of manual labor. Our scientific research has cut down the opportunities for foreign trade by affording substitutes for natural rubber, quinine, and the like, and the growth of our merchant marine has reduced the amount of shipping service we formerly bought from others.

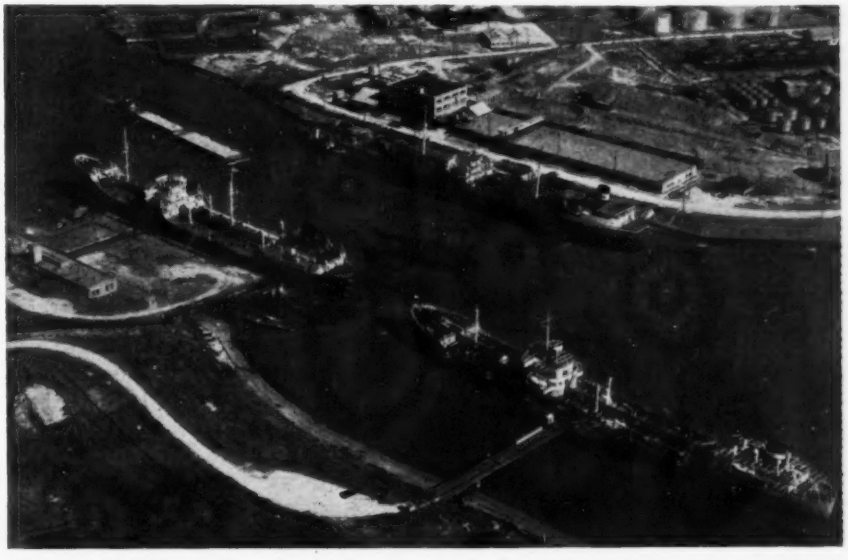
What is happening in other countries? Nationalistic feelings are intensified everywhere; most nations are desirous not only of rebuilding their devastated industries, but adding new ones; tariffs are being increased for protection rather than decreased for trade. A world-wide trend to industrial independence, sometimes strengthened by considerations of military security, is the motivating force behind all of these changes. India, for example, just increased certain duties in order to protect newly-developed chemical industry in that country. In spite of the platitudes we read and hear, we must face realistically the fact that in the immediate future, at least, international trade will not be easier than prewar, but considerably more difficult.

Let us not be fooled by statistics. In 1946, U. S. exports of chemicals and allied products reached the high dollar value of over $500,000,000. This appears most gratifying, but a large part of it was directly or indirectly financed by American loans or by the exhaustion of dollar balances. Rehabilitation needs will create a huge demand throughout 1947 and perhaps longer, but they are certainly not a sound basis for predicting future export potentials. Foreign nations will of necessity free themselves from dependency upon U. S. goods, and once urgent demands are satisfied, export demands will slacken.

Furthermore, we are separated by wide expanses of ocean from both Europe and Asia. But right between these two continents, and separated from neither, is Russia. Victorious in war, she is intent upon rebuilding her industry and extending her political and economic influence. She is ambitious. With the zeal of a crusader she is eager to show that she can compete with private capitalism, and she has the resources to do it. Eventually Russia will produce enough to export. Europe is on her doorstep, and Asia is practically within her domain. America will ultimately grapple with a well-matched competitor for the markets of the Old World.

BETTER SERVICE NEEDED

Aside from these economic difficulties, American manufacturers have to face certain technical difficulties not to be overlooked. Products designed for American customers are not necessarily the most suitable for foreign requirements. We cannot expect that by sheer force of advertising we shall be able to change the customs of other peoples in such a way that they will give up their habits for



Tankers are loaded with petroleum products for export in the Houston, Tex., ship channel.

Foreign subsidiaries may be the key.

ours. The British—and, before the war, the Germans—have no such illusions. They familiarize themselves with the wants of their customer countries and adapt their products to satisfy those wants. There are few instances, on the other hand, where American firms produce a special line of goods for export.

The chemical industry has particular problems along these lines. More and more have we become convinced of the need for close contact and cooperation between manufacturer and consumer in order to get the most out of new developments. Technical service and market research departments to work with customers are becoming increasingly important in chemical relations.

But this kind of service is lacking for the foreign customer. We can export a product like ammonium sulfate without worrying about its suitability as long as the usual standards are observed and the product is properly packed for export. But an increasing number of chemicals is being produced for specialized needs. These—among which synthetic resins and textile chemicals are examples—require effective liaison between producer and user in order that they may be utilized to the utmost. We may produce chemicals which have no use abroad; on the other hand, there are possible markets in other lands for chemicals we could manufacture but do not. Close contact with the customers is the only way to find these out.

FARBEN KNEW HOW

I. G. Farben, William F. Zimmerli points out (CHEMICAL INDUSTRIES, March, 1946, p. 409), maintained a highly efficient international customer service. The consuming industries relied greatly upon this organization for advice and help, and the strong world-wide position of I. G. Farben was even further fortified thereby.

The collapse of the I.G. has left a vacuum which American industry can fill. Export is of political as well as of economic importance. The modern version of the old adage, "The trade follows the flag," reads, "The flag follows the trade," where 'flag' stands for political good will. From the economic point of view, there is the primary fact that American industry, based on mass production, requires a high output to be profitable, and that with increasing capital investment the "break-even point" is higher than before the war. A difference of 10 per cent in output may be critical, and exports may well become the decisive factor.

Once we are convinced, we must prepare to do a good job. We should send abroad our best men—men who can not only sell, but who are technically trained so that they can advise customers. Foreign representatives should not be a forgotten legion: They should enjoy the same salary and promotional opportunities as their stay-at-home colleagues.

These men should prepare themselves to avoid the mistakes made by so many American firms in the past—mistakes of customs and manners which could easily have been avoided. This is of greatest importance in Asia, where customs differ so greatly from ours; and here such an institution as the School for Asiatic Studies, in New York, can be of help.

FOREIGN SUBSIDIARIES

Another aspect of export—setting up manufacturing facilities in other countries—is an alternative which should be seriously considered by every American manufacturer who wants to extend his business horizon. This idea, of course, is not new. Among chemical manufacturers, especially the larger ones, are to be found a number with foreign associated or subsidiary firms.

Until recently, however, it has generally been taken for granted that such foreign subsidiaries should be fully owned or at least directly controlled by the parent organization. Foreign management has been suspect; managers of the parent organization have usually insisted upon full authority over the affairs of the foreign subsidiary. As a result, these subsidiaries have been branded as "foreign" companies in the country of operation, and all the disadvantages of the epithet have accrued to them. These disadvantages were not too apparent in the 20's but as national feelings grew more intense during the 30's, the position of foreign-owned subsidiaries worsened.

Now a new philosophy is stirring. Manufacturers have learned that they can cooperate in foreign manufacturing without having full control of such operations. Recently several American firms have brought in their technical experience and manufacturing rights in exchange for a minority of the foreign firm's stock, eventually supplemented by some management agreement giving the desired protection to American interests. Such cooperative enterprises can be worked out to great mutual advantage and do not require large dollar investments abroad.

This country has a tremendous store of technical experience. Many foreign scientists, on the other hand, fled here before and during the war, impoverishing their native lands of the best brains. Now these countries need brains as well as technical experience to rebuild and ramify their industries.

The coming years will therefore offer opportunities for American manufacturers to take an active part in foreign industry. Even now several countries are welcoming such participation. The Dutch, for example, recently established the Institute for Netherlands American Industrial Cooperation, a private non-profit organization set up to encourage this kind of joint effort.

In many cases it should be possible by agreement with foreign partners to sell products under established American trade names, thus enhancing their prestige and establishing good will for their manufacturers.

Needless to say, thorough investigation is required to determine what country or countries are most suitable for such operations. Similar care must be exercised in choosing a foreign partner in whom the American producer can place his trust. Even more than in the case of exporting goods will it be necessary to have such investigations carried out by men who are familiar with the area under consideration. Often it will be desirable or even necessary to obtain the cooperation or at least the approval of the government in question. Once satisfactory arrangements have been made, however, a great deal of the work may be left to the foreign partner; and the enterprise will then require far less attention on the part of the American manufacturer than if he owned the enterprise in its entirety.

If the partner has a solid technical background, it may be expected that in the long run the flow of research and development will by no means be in one direction. Particularly in western Europe is it advisable to stipulate that part of the profits will be used for research, the results of which will be available to the American participant. Brains are cheaper in Europe than they are here, and such investment may pay handsome dividends in due course.

COMPLEMENTS EXPORTS

Foreign manufacturing should not be considered a reversal of product export, but rather a complementary function.

In the long run we cannot expect foreign countries to pay for high-priced American labor in the form of finished products. But we should be able to sell mass-production goods requiring high-capital investment but little labor.

In short, an intelligent combination of export and foreign manufacturing in the form described here will give the chemical producer, as well as others, a remunerative opportunity to be instrumental in world-wide reconstruction and technical furtherance. American prestige abroad will also be enhanced, and thus this course will serve a national purpose.

These pinion gears are from test axles operated under high torque. The gear at the left, operated without an extreme-pressure lubricant, shows ripples on the metal surface. The one at the right, used under the same conditions with a good EP lubricant, is satisfactory.

CHEMICAL ADDITIVES Provide Custom-Designed LUBRICANTS

by F. L. MATTHEWS, Research Department
Monsanto Chemical Co., St. Louis, Mo.

THE PETROLEUM INDUSTRY NOT ONLY SUPPLIES raw materials for chemicals, but it is consuming increasing amounts of synthetic organic chemicals in compounding its own products. It is conservatively estimated that over 6,000,000 pounds of additives are going annually into lube oils.

A DICTIONARY definition of *synthesis*, "a composition or combination of parts or elements so as to form a whole", precisely describes the procedure followed in the compounding of modern lubricants for automotive crankcases and gears. The day when a refiner separated crude petroleum into several fractions by distillation and used one of these for lubrication is past.

True, crude petroleum is still separated into several fractions by distillation. The lubricating oil fraction, however, is further subdivided according to viscosity or specific gravity. Each of these subfractions or base stocks is treated—quite often each is treated differently—by chemical agents such as sulfuric acid or active clays, or by solvents such as phenol, cresol, furfural or propane.

The proper combination of additive and base stocks is then selected on the basis of accumulated experience covering fundamental research on the properties of lubricants, large and semi-large scale laboratory duplications of practical engines and gear sets, and on actual field experience.

There is a voluminous patent literature relating to various types of oil additives. The very profusion of data, however, makes it extremely difficult to identify the particular additives used. A recent, authoritative survey of the chemical types encountered—in so far as it is possible to make absolute statements about the compositions involved—has been published by Hamilton and Keyser.*

We are concerned here with a brief summary of some of the major types of additives for crankcase and gear oils, and their blending with selected base stocks to control the following properties of the finished lubricant:

1. Viscosity
2. Low-temperature fluidity
3. Stability and anti-corrosiveness (crankcase oils)
4. Engine cleanliness (crankcase oils)
5. Shock load resistance (gear oils)
6. High torque resistance (gear oils)

* Hamilton, L. A., and Keyser, P. V., Jr., *National Petroleum News*, March 6, 1946.

IMPROVED VISCOSITY INDEX

The viscosity or "body" of lubricating oil is one of the major factors in determining its ability to lubricate under hydrodynamic conditions. The property important in this respect is the viscosity at operating temperatures.

The lubricant compounder, however, is faced with the problem of not only producing an oil with the proper viscosity at operating temperatures, but also one which will not have an unduly high viscosity at the lowest temperatures encountered in service. Taking both of these factors into account has resulted in the SAE numbered grades of lubricants (10, 20, 30 etc.) for different seasonal and operating temperatures. Securing the proper viscosity for each of these grades usually requires the blending of two or more base stock components.

The lubricant compounder is also confronted with the problem of keeping the low-temperature viscosity as low as possible and the high-temperature viscosity as high as possible. This, essentially, means controlling the temperature coefficient of viscosity of the lubricant. The viscosity-index concept applies a convenient numerical scale to this temperature variation, a lubricating oil of highest

viscosity index (for a given viscosity) having the lowest temperature coefficient.

The search for lubricants of higher and higher viscosity index has led, first to refining techniques of increasing severity, and then to the development of a series of chemical additives which, when compounded with lubricating oils, flatten the viscosity-temperature curve. The effectiveness of these additives is readily measured in laboratory viscosimeters, but viscosity stability must be confirmed in test engines.

These materials are known as viscosity index improvers and are usually polymers of rather high molecular weight. High molecular-weight polymers of isobutylene were among the first materials to be used for this purpose. More recently, other products have also been marketed which are reported to be polymers of methacrylic esters.

By the use of these chemical additives and the proper blending stocks, the modern compounder can secure the desired high-temperature viscosity without unduly increasing the low-temperature viscosity of the lubricant. In fact, viscosity-index improvers have been developed to such an extent that lubricants so treated can bridge two or more SAE viscosity grades.

BETTER COLD FLOW

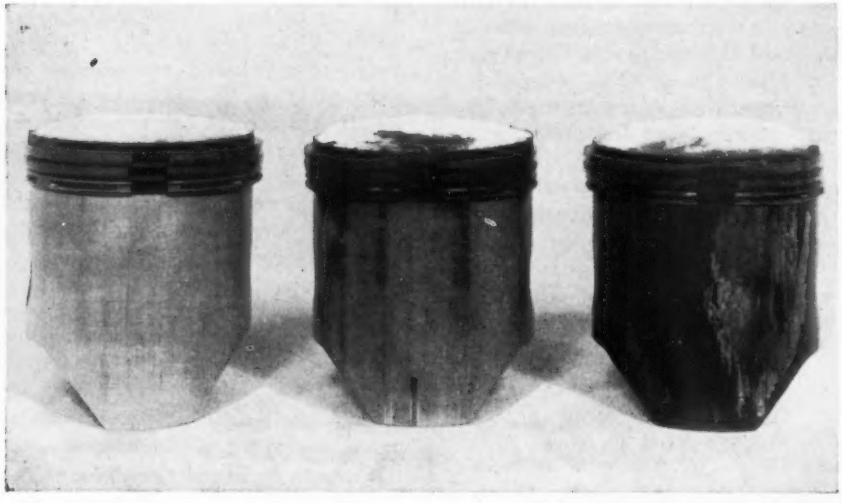
As many lubricating oils are cooled, a temperature is reached at which wax begins to crystallize. If this process is continued, the lubricating oil will set to a solid mass before the intrinsic viscosity would indicate such solidification. The modern refiner, by selecting low wax content crudes or by use of dewaxing procedures (usually involving a solvent), can either avoid or remove much of the wax in lubricating oil and thus reach a lower solidification temperature or pour point. Very low wax crudes are relatively rare, however, and dewaxing is quite expensive.

Additives, known as pour point depressants, have been developed to enable oils to flow at low temperatures. These materials act by modifying the crystalline structure of the wax and inhibiting the rate of growth of the crystals. Evaluation of pour point depressant action in the laboratory is as yet imprecise except for screening, and dependence is placed on field experience.

Historically, the most successful pour point depressants have been alkylated aromatics. The two earliest types are condensation products of chlorinated wax with naphthalene and phenol, respectively, which are further condensed with organic acids. Several new additives have recently appeared which are designated to prevent pour point reversion, but the nature of their composition has not been disclosed beyond the fact that they are polymeric.

Of major importance to continuous satisfactory performance of a lubricant is its ability to resist deterioration and its lack of corrosiveness toward hard alloy bearings. Lubricants from some crudes show great natural stability and anticorrosiveness. Moreover, some refining techniques are able to enhance these qualities.

Gasoline engine pistons after an oil stability and corrosion test. The left piston used a straight oil; the middle one, an oil with minimum inhibitor content; the right, the optimum.



Courtesy Standard Oil Co. (Indiana)

Difference between premium and regular motor oils is even more striking here. Chevrolet 36-hour tests were run with commercial premium (two at left) and regular (at right) oils.

MORE STABLE AND LESS CORROSIVE

However, for almost all oils used in modern passenger cars, trucks, and buses, it is necessary to compound a chemical additive with the selected base stocks to inhibit deterioration and attack on bearing metals.

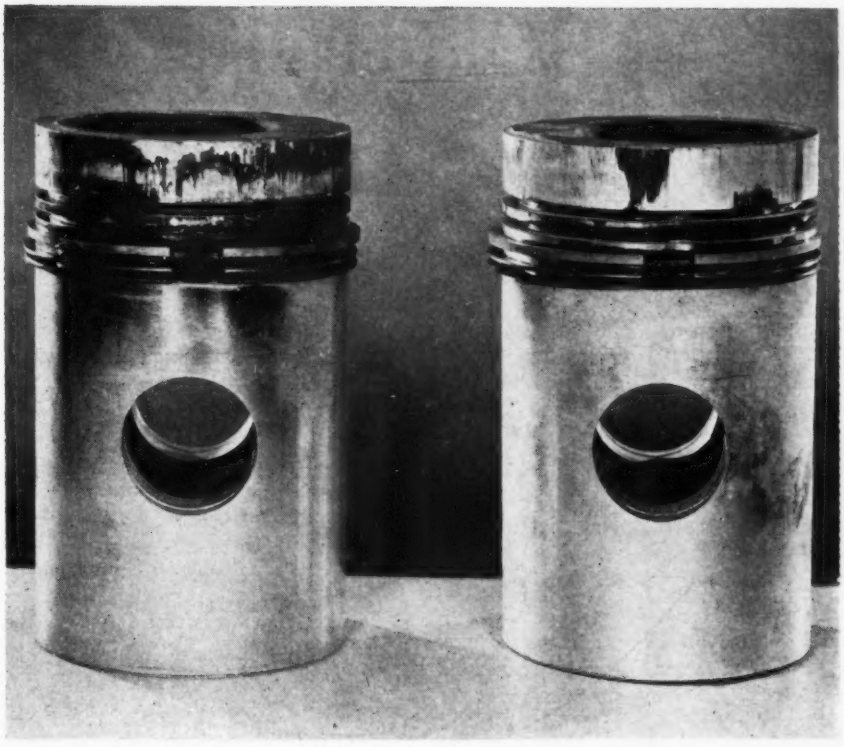
These chemical inhibitors have been of widely varied nature. The evaluation of the performance of an inhibitor-base stock combination requires the running of full scale engines in the laboratory and finally field testing.

A great many oxidation inhibitors have been used in motor oils. Perhaps the ones of longest standing are the alkyl phenol sulfides and sulfurized fatty oils. These were followed by alkyl aromatic phosphites and more recently by the reaction products of phosphorus sulfides and various organic materials.

CLEANER ENGINES

Freedom of action of both compression and oil-control piston rings in modern gasoline and Diesel engines is vital to the proper performance of the engines. The accumulation of oil-deterioration or fuel-combustion products in the ring zone, which impede ring action, results in impaired efficiency of operation and eventual breakdown. Moreover, deposition of sludge or heavy lacquer in other parts of the engine may also impede oil flow to vital parts.

Of course, if an oil were completely stable, oil deterioration products would be eliminated. Such an oil is not yet



These Diesel engine pistons were operated in a detergency test. The left one used an oil containing an insufficient amount of detergent additive, the one on the right, the proper amount.

available. With existing oils it has been found that proper selection of crudes and refining techniques can go a long way toward minimizing ring-zone deposits and keeping engines clean. Mechanical filters also will remove whatever sludges are carried to the filter.

However, in all cases it has been found that for heavy duty service it is required —and for medium duty service it is desirable—to use detergent additives, which function by dispersing the products of oil deterioration and prevent their agglomoration. The use of these detergents or dispersants results in remarkably cleaner ring zones, longer life to the rings, and generally improved engine cleanliness. It is of interest to note that by virtue of their action in dispersing decomposition products, these detergents quite often cause used oils to appear black.

The evaluation of detergent oils is subject to the same limitations as is the case with inhibited oils. Full-scale engines must be run in the laboratory followed by field tests.

Modern detergent-dispersant additives are usually metal salts of organic acids or of alkyl inorganic acids. Among these are petroleum sulfonic acids, highly alkylated aromatic sulfonic acids and di-substituted dithiophosphoric acids. Other compounds used include highly alkylated phenol sulfides and partially hydrolyzed reaction products of olefins and phosphorus pentasulfide.

BETTER SHOCK RESISTANCE

The development of the modern hypoid axle resulted in improved vehicle design; but at the same time, it placed upon the lubricant being used the necessity of being able to perform under high sliding forces at high speeds. This characteristic has been measured by acceleration-deceleration trials known as "shock tests," and satisfactory materials are said to be high EP (Extreme Pressure) lubricants.

Uncompounded base stocks are generally unable to meet these requirements and the lubricant compounder *must* resort to chemical additives. Their evaluation again necessitates the use of full scale axles in the laboratory followed by field trials. Contrasted to the other additives mentioned above, dependence of performance on the nature of the base stocks is more limited, and uniformity in additive requirements more marked.

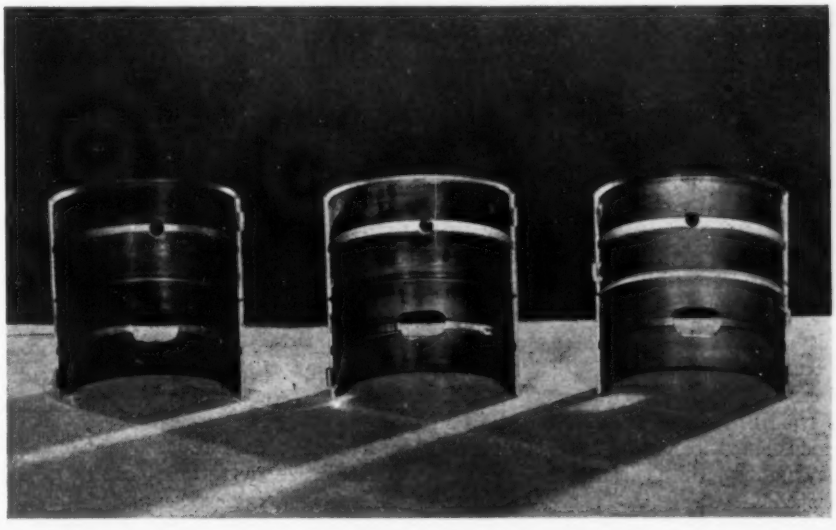
The number of materials used as extreme-pressure agents for gear oils is literally legion. Some of the older materials were lead soaps, various sulfur compounds, and sulfur-fat reaction products. The use of alkyl aromatic phosphites has also been reported. Recently, however, alkyl disulfides, aromatic chlorine compounds and mixtures of aromatic and aliphatic chlorine and sulfur compounds have received the most attention.

HIGHER TORQUE RESISTANCE

Recently more and more emphasis has been placed on the ability of gear lubricants to withstand service conditions of low speed and high torque such as are encountered in heavily loaded trucks operating over mountain roads. This has made necessary a whole new series of chemical additives which are still relatively too recent in development for cataloguing. The problem of base stock selection and response has been reintroduced into gear lubricants by this requirement.

In addition, the present tendency is to require gear lubricants for passenger cars, trucks, and buses to meet both the high-torque and shock-load service tests in laboratory axles and field tests. This further complicates the selection of crudes and refining techniques, and selection of additives and dosage.

The examples cited of the use of chemical additives and multi-component blending in the cases of crankcase and gear oils are only a few of those possible in the broad field of lubricants. In general a lubricant for a specific job is created by careful selection of base stock components (covering crudes and methods of refining) and blending with one or more chemical additives. This process can then, with justice, be called synthesis and the resultant lubricants are truly synthetic materials.



The bearing at the left came from a gasoline engine using straight oil. The center and right bearings were lubricated with oils containing minimum and optimum amounts of inhibitor.

Save on New Plant START-UP TIME

by FRANCIS N. JOYCE
Toledo, Ohio

THE MANY NEW CHEMICAL PLANTS coming into operation soon will face the old problem of "licking the bugs" that stymie production, disrupt quality and skyrocket costs. Here is the story of how one anonymous plant cut its start-up troubles almost to the vanishing point by a sound program of perfecting mechanical features before attempting production.

THE NEW CHEMICAL PLANT was started up on the "graveyard" shift. Pumps and conveyors were turned on, feeds were started, heats were turned up, and flows were adjusted. Everything went off just as it was supposed to and the controllers took over the operation without a hitch. Within a few hours the new plant was turning out a top quality product at 100 per cent of its rated capacity.

When this actually happened many who saw it thought that it was something of a miracle. They had been through many "start-ups" themselves, and always there had been a painful period of weeks and months of adjusting, fixing, breaking in, revamping—a period of small production and poor quality product.

There were a few men, however, who were not at all surprised by the smooth start-up in this case. They knew it would go that way because they had planned the whole thing. One cardinal principle had guided their plan: Every item of equipment must perform mechanically to perfection before any actual production would be attempted.

The plan and the performance in this case stood out in contrast to the more common practice of waiting until the construction work is all completed, and then trying right off to start production with the hopeful idea that this time everything will go all right, but with the fear that it may not.

THE GAP—CONSTRUCTION TO PRODUCTION

The secret of the smooth start-up in this real case was that a few men had succeeded in filling the usual gap between the construction and production. It is typical in new chemical plants for the production personnel to stay out of the way until the last construction man has stepped off the plant. Then, of course, there is a lot of pressure from sales and management to get into production. So all efforts are bent on starting the plant.

Also typical of this practice are such wasteful and provoking mishaps as fuses blowing out, motors burning out, gaskets inadvertently omitted, manhole covers not tightened down, valves that leak, gears that fail, pumps that are not packed, and controllers that won't control. When these minor catastrophies happen during operation with corrosive and toxic process materials, they are often very difficult to rectify, and they may be costly in loss of valuable materials. It is a time-consuming job to empty and decontaminate equipment before men can work on it. And mechanical failures at crucial points in the process can destroy or damage valuable materials due to the poor reaction conditions resulting.

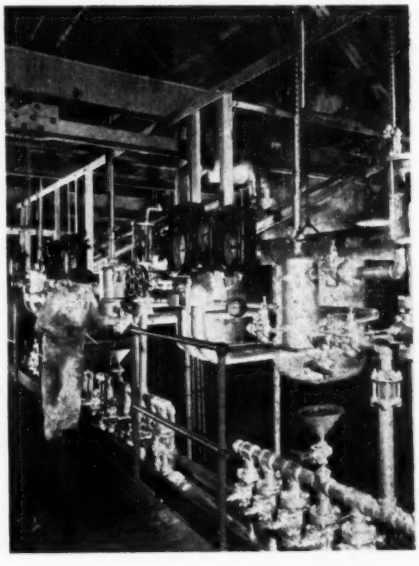
If all this sounds like much ado about nothing, just take a look at some of the unfortunate things that have actually happened in several new plant start-ups: In one plant the operators found in attempting to start production that the water line to one condenser didn't deliver any water. A little line tracing disclosed the trouble—some dazed pipefitter had connected the line to a hand-rail instead of to the water main. In another case the reaction yield on one piece of equipment ran low for several weeks before the cause was located in a temperature controller which was reading 20 degrees off.

Several years ago a large new plant had a lot of trouble getting the brand new vacuum pumps to pull any vacuum. These pumps were of the reciprocating type, and consequently they had been shipped from the manufacturer with cork cushions under all the valves to prevent damage in transit. But, the construction crew hadn't removed the cork cushions. The trouble was easily corrected after it was found, but it held up operations for a couple of days before anyone thought to look inside the vacuum pump itself.

In another case a heavy-duty plastic mixer was installed just as it came from the maker. It seemed to run smoothly when empty, so raw materials were charged and the reaction began. As the load built up the bearing on the jack-shaft slipped and the drive gears jumped out of mesh. The trouble was that ½-inch bolts had been used in the 1-inch holes in the pillow block base. As the gear tooth pressure increased with the load, the whole bearing moved. Fortunately the gears were not stripped, but what happened in the reaction was not so fortunate. It was one of those reactions that requires continuous agitation to prevent the entire mixture from setting up into a concrete-like mass; hence, the drive failure caused a delay of a couple of days while laborers literally dug the corrosive mass out by hand.

A new oil-fired heating furnace was installed in another plant, but somehow the buck-stays were inadvertently left off. It was only a few days until the roof arch fell in. The job of rebuilding the furnace held up any further attempts at production for a period of about a week.

These are only a few examples of the frequent casualties encountered in starting a new chemical process. They are not peculiar to any company or plant. They happen so regularly that they are usually expected. No one can tell just what troubles will develop, but most of those who have had some previous experience are resigned to the fact that there will be plenty of "bugs" to lick be-



There are so many mechanical details in the assembly of a chemical plant that it is humanly impossible to get them all perfectly correct without considerable checking.

fore good, efficient operation is achieved.

HOW THE GAP WAS CLOSED

The new chemical plant that started up so free of the usual difficulties didn't just happen. An extensive trial run and testing program preceded the actual production start-up. In over six weeks of preliminary test work each item of equipment and the entire processing system was brought to a point of substantially perfect mechanical performance.

The formulation of this program was based on two sound concepts of a new chemical plant: (1) There are so many thousands of little details in the assembly of a complete plant that it is humanly impossible to have every one of them absolutely correct. Hence, it is advisable to seek out and correct the many minor errors that are bound to creep in. (2) The process development and the plant design are assumed to be fundamentally sound. Presumably the proper chemical performance will result when the prescribed physical conditions are attained. Therefore, it is reasonable that the physical behavior of the equipment should be assured before it is put to work on the process chemistry.

With this philosophy a three point program was laid out and carried through. The three phases of the work were: (a) Tests and dummy runs were made on all items of mechanical apparatus and on all instruments and controls. (b) Heat transfer and flow tests were run on all equipment designed to heat or cool process flows. (c) The entire system was thoroughly tested for leaks, and the whole system was cleaned and flushed out.

The test program was carried out by representatives of the engineering design group, the operating supervision and the plant maintenance staff. These men had on call labor to perform certain necessary parts of the work and special mechanical craftsmen to make corrections in the equipment or the system as flaws were discovered.

Mechanical equipment such as pumps, compressors, blowers, conveyors, agitators, filters and dryers were tested under simulated load conditions. Cheap and innocous materials like air, water and sand were employed to simulate loads. Where it was undesirable to contaminate the system with any of these materials, other substances were used—alcohol, nitrogen, one of the raw materials or some of the product obtained from pilot plant operation. The use of relatively inexpensive and harmless materials for simulating loads made the job of correcting adjustments very simple because a man can put his hands in water or sand, and there is no great loss if the material has to be dumped out onto the floor.

Load tests were run on many critical pieces of equipment for periods of 48 hours or longer. Some types of equipment which come to equilibrium slowly—furnaces, kilns, etc.—had to be run for a week or more in order to test their performance under the anticipated operating conditions.

All instrument and control calibrations were verified using standard reference materials for temperature devices, dead weight testers for pressure instruments, etc. Flow controllers were tried under actual flow conditions to make sure that direct-acting controls had not been coupled to the wrong type of valves. Scale calibrations were checked.

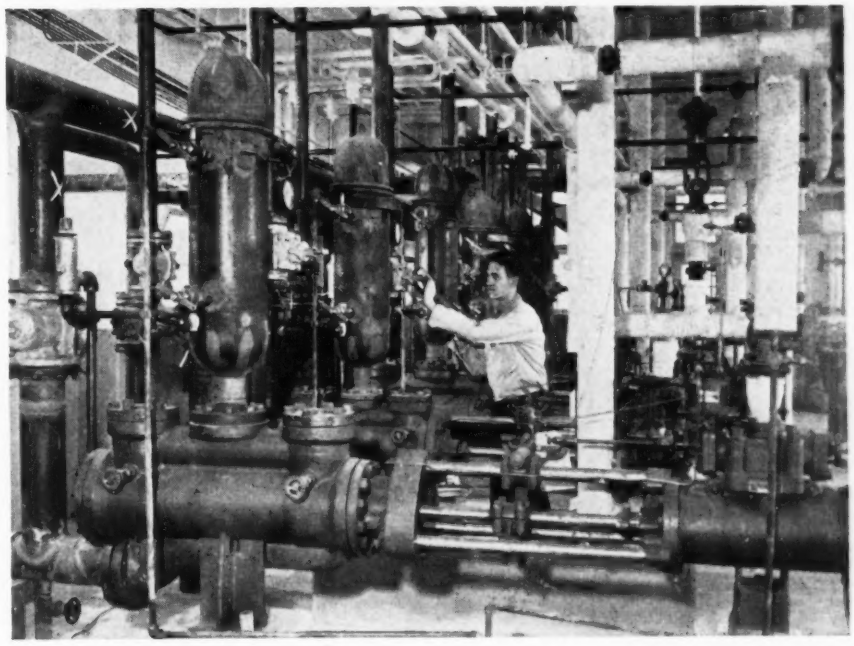
Process equipment for heating, boiling, condensing and cooling were given trial runs with water, alcohol, or other materials to prove that all service lines would deliver adequate amounts of steam, water, power, etc.; and, to check the performance of heat transfer surfaces, traps, controls and other auxiliary devices. In all cases attempts were made to simulate the actual process loads.

Using pressure, or vacuum, the entire system of equipment and piping was tested for leaks. In some cases special techniques such as soap solutions, or ammonia and sulfur dioxide were employed to locate leaks. Then the entire system was thoroughly cleaned of scale, dirt, scraps, chips, etc.

Throughout this program many hundreds of corrections were made. Motors were changed, pump packings were changed, leaks were repaired, valves were replaced, adjustments were made. When actual production was attempted there was very little doubt that the plant would perform as it was intended. There were, of course, still some things that had to be fixed after the plant went into production—it was impossible to simulate adequately certain process conditions such as tar formation, scale build-up, and localized corrosion. But the total time required for correcting such peculiar situations didn't lose more than three or four days of full production in the first year of operation.

HOW MUCH TIME WAS SAVED

As previously stated the time consumed in this preliminary work to assure mechanically perfect performance was a little over six weeks. Actually the time elapsed between the final completion of construction and the production start-up was only three days. The major part of the test work went along simultaneously with construction. As each unit of the plant was completed, the test crew went to work on it. In cases, the installation of certain equipment requiring longer trial runs was completed early.



New chemical plants often struggle through periods of three to six months of low production and intermittent operation while the "bugs" are being worked out of the process.

The time and money saved by this careful pre-production testing can be judged from the performance of five other new plants where little, if any, real testing of mechanical performance was done prior to attempting production. In all cases there was a protracted period of on-and-off operation, low quality product and meager output. And, in all of these cases the numerous false starts and set-backs involved valuable raw materials and the full expense of plant labor and overhead. In Plant No. 1 it was four months before any semblance of continuity and efficiency was established; in Plant No. 2, it was three months; in Plant No. 3, it was three months; in Plant No. 4, it was six months; and in Plant No. 5, it was three months.

While there is only one case against five, the evidence is fairly conclusive that substantially perfect mechanical performance of a plant should be a prerequisite to any attempts at operation on production.

OAT HULLS → ADIPONITRILE → NYLON

by OLIVER W. CASS, Research Supervisor*
E. I. du Pont de Nemours & Co.,
Niagara Falls, N. Y.

A PLANT UNDER CONSTRUCTION BY DU PONT at Niagara Falls, N. Y., will eventually utilize the furfural from over 100,000 tons of agricultural by-products annually to make hexamethylene diamine by a new process. Adipic acid, the other nylon constituent, can also be made from furfural.

ALMOST a decade ago, in 1938, the Du Pont Company announced nylon to the public, and in that year, commercial production was begun.

It was the culmination of over 10 years' fundamental research and pilot plant activities carried out by Du Pont, not only on the production of the finished fiber, but also on the manufacture of the required chemical intermediates for the fiber —namely, adipic acid and hexamethylene diamine—for the production of which no commercial process was available. The processes originally developed made use of phenol (and later benzene), ammonia, and atmospheric oxygen.

Alternative routes to these two chemical intermediates were early investigated by the Du Pont research organizations. In the fall of 1935, three years before nylon was announced to the public, the Electrochemicals Department, with laboratories at Niagara Falls, N. Y., began work on the development of an alternative process for the production of nylon intermediates using furfural as the major raw material. This work has extended over the past 12 years, and has resulted in the development of a process for the production of adiponitrile—a key intermediate for nylon—from furfural. The construction of a Du Pont plant at Niagara Falls for the operation of this process has begun.

FURFURAL IS CHEAP

Furfural can be manufactured from a wide variety of agricultural by-products —oat hulls, corncobs, cottonseed hulls, flax shives, bagasse, peanut shells and rice husks—or it may be recovered as a by-product of the wood-fiber industry. The manufacture of furfural was pioneered in the United States by Quaker Oats Co., who retained the Miner Laboratories, and was first offered commercially on the American market in 1922 at $2.50 per lb. By 1926, the price had dropped to 17½ cents per lb. in drums, and in 1930 to 9 cents per lb. in tank cars. Because of the pioneer work of this company, technique and experience were available for the expansion of furfural production demanded during the war by the synthetic rubber program.

The Quaker Oats Co. will supply the furfural needed for this new adiponitrile process as soon as the Niagara Falls plant begins operation. Quaker Oats estimates that over 100,000 tons of agricultural by-products will be utilized annually to supply the maximum amount of furfural Du Pont may need for this process.

As a raw material for chemical processes, furfural possesses many attractive features. It is avilable in essentially unlimited quantities, and, unlike raw materials derived from natural gas, petroleum, or coal, is "grown" each year, so that no depletion of furfural sources need be feared.

The process may be outlined as follows: Furfural is catalytically decomposed to form furan, which is hydrogenated to the saturated cyclic ether, tetrahydrofuran. This compound is reacted with hydrogen chloride to yield 1,4-dichlorobutane, which is converted to adiponitrile by reaction with sodium cyanide. Adiponitrile is then hydrogenated to hexamethylene diamine. Hexamethylene diamine and adipic acid combine to form nylon salt, which, upon processing, yields the nylon fiber of commerce.

The manufacture of furan from furfural is the first step in this new route to the nylon intermediate, adiponitrile. The manufacturing process involves the catalytic removal of the aldehyde side chain from furfural as carbon monoxide. The reaction is carried out at 400°C over a catalyst consisting of a mixed chromite of zinc and either manganese or iron.[1] The furfural is vaporized and mixed with steam before passage over the catalyst. The carbon monoxide which is released by decomposition of the furfural reduces the steam to form carbon dioxide and hydrogen. Furan, unconverted furfural, and water are condensed from the gas mixture passing from the catalyst chamber, leaving a mixture of equal volumes of hydrogen and carbon dioxide as the uncondensed gaseous product of the reaction. The conversion of furfural to furan is nearly complete and the yield of furan is high. After some hours operation, the catalyst requires reactivation. This is readily carried out by diverting the furfural and steam to a second reactor, and reactivating the spent catalyst with a stream of air, followed by a short reduction with hydrogen.

FURAN IS HYDROGENATED

The second step in the new furfural to adiponitrile process is the hydrogenation of furan to tetrahydrofuran. This process may be carried out either batchwise or continuously, in the presence of suitable catalysts.[2] The yield of tetrahydrofuran is nearly theoretical.

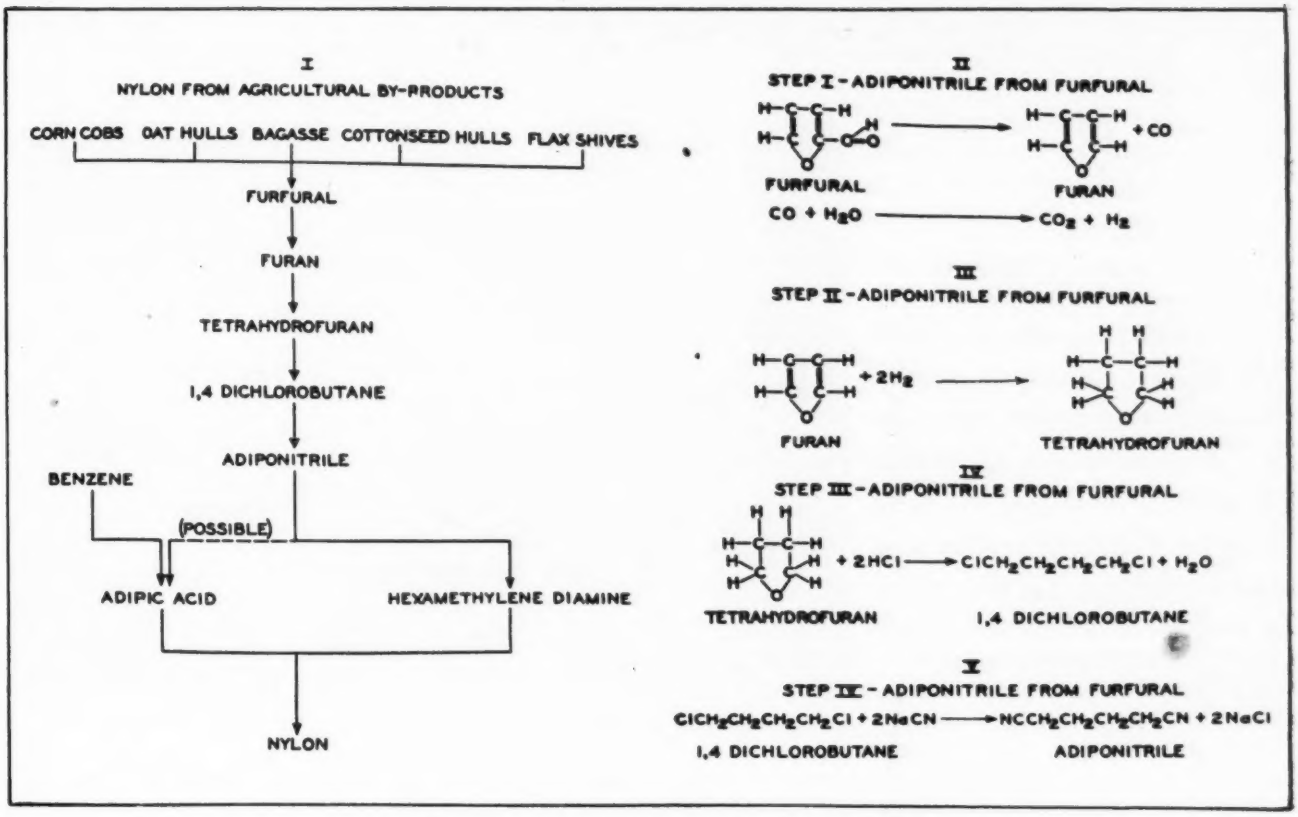
The third step involves reaction of tetrahydrofuran with hydrogen chloride to form 1,4-dichlorobutane. This reaction may be carried out in a number of ways. If desired, tetrahydrofuran, hydrogen chloride, and water may be heated under pressure at elevated temperatures with or without catalytic materials. Hydrogen chloride may also react with tetrahydrofuran at atmospheric pressure in the presence of dehydrating agents such as zinc chloride or sulfuric acid, to give good yields of the dichloride.[3]

Still a third method of carrying out this reaction involves the use of amine hydrochlorides as catalysts for the reaction. In all of the above methods of converting tetrahydrofuran to 1,4-dichlorobutan, the yields of the dichloride are nearly theoretical.

The fourth step involves the conversion of 1,4-dichlorobutane to adiponitrile. This is carried out by reaction of the 1,4-dichloride with sodium cyanide in the presence of an appropriate solvent. The sodium chloride which is formed is insoluble in the reaction mixture; it is removed by filtration and the solvent and adiponitrile are then separated by fractional distillation. Yields on this step also are high.

The hydrogenation of adiponitrile to hexamethylene diamine, reaction of this

* Abstracted from a paper presented before the meeting of the National Farm Chemurgic Council, at Oklahoma City, Oklahoma, March 27, 1947.



Flow diagrams for the conversion of furfural into adiponitrile

with adipic acid, and further processing of the product to nylon, are carried out by means of established industrial practice.

ADIPIC ACID ALSO POSSIBLE

Adiponitrile can also be hydrolyzed to adipic acid, the other main intermediate in the process for nylon. However, the present installed facilities for the production of adipic acid from benzene, and not from furfural, will continue to be used.

A result of this new method of manufacture for nylon from furfural will be the availability of three chemical intermediates—furan, tetrahydrofuran, and 1,4-dichlorobutane—for other uses. δ-chlorovaleronitrile can also be made available by a slight change in operating procedure. The Electrochemicals Department of the Du Pont Co. has explored extensively other new synthetic organic chemicals derived from furfural.

To illustrate the versatility of furfural as a chemical intermediate, a simple example can be given: Examination of the first step in the new process for adiponitrile from furfural shows that the carbon atom present in the side chain of furfural is removed as carbon monoxide. Other methods of operation may be used, however, which retain this carbon atom in the side chain as a methyl group, giving the compound 2-methyl furan; or expansion of the ring by rearrangement can give the 6-atom ring compound dihydropyran. These two compounds may be handled in much the same way as furan, yielding pimelonitrile and methyl adiponitrile, respectively, in place of adiponitrile.

As a result of this exploratory work, several other compounds based on furfural as a raw material have been made available for experimental purposes. Among these are 1,4-butanediol, dihydropyran, tetrahydropyran, 1,5-pentanediol, 1,5-dichloropentane, 2-methyl furan, and 2-methyl tetrahydrofuran. The availability of additional compounds derived from furfural will be announced as this work proceeds.

Although these new furfural chemicals have been subjected to only preliminary evaluation a number of applications can be mentioned.

INTERMEDIATES ARE OF INTEREST

Tetrahydrofuran and tetrahydropyran are extremely active solvents for a wide variety of natural and synthetic products. For example, both vinyl chloride and vinylidene chloride type resins are highly soluble in either of these materials, while the moderate boiling points of the compounds (66° and 88°C, respectively) make their use as film-casting solvents for chlorovinyl resins attractive.

Furan, methyl furan, tetrahydrofuran, and dihydropyran may be polymerized under a variety of conditions to yield polymers with a wide range of properties.

The greatest potential use of these compounds, however, is as chemical intermediates for the preparation of 4 and 5 carbon-atom chains with a wide variety of reactive groups at each end. These compounds appear promising for the synthesis of pharmaceuticals, vitamins, plasticizers, and condensation products.

FURANS A PROMISING FIELD

In 1939 four years after the work which has just been described was begun, Dr. F. N. Peters, in an article entitled *Industrial Uses of Furans*, closed his remarks with these observations:

". . . Research is increasing. A prominent German chemist said recently that, if he had his way, he and his entire staff would spend all their time in the field of furan chemistry. An equally prominent American chemist has predicted that, within twenty-five years, furan chemistry will be as well established industrially as benzene chemistry. Although this may seem an exaggeration, it is perhaps closer than many of us realize."

The field of furan chemistry which Dr. Peters so enthusiastically recommended in this paragraph has now been opened up. It is possible—even probable—that this field of chemistry will show as many outstanding results in the next decade as did the field of benzene chemistry or the field of lower aliphatic chemicals when these were first intensively evaluated. The development described here is only one of many such coming achievements.

REFERENCES

1. U. S. Pat. 2,374,149.
2. U. S. Pat. 1,006,873.
3. U. S. Pat. 2,218,018.

No. 15 of a Series on
INFORMATION SOURCES FOR CHEMICAL MARKET RESEARCH

A COMPANY'S OWN SALESMEN can be one of its most valuable sources of market information. Here is a discussion of some of the fundamentals of setting up and using a system of trade analysis based on salesmen's reports, and how such a system can be worked into a market research program.

A part of the offices of Du Pont's trade analysis division at Wilmington.

MEASURING MARKETS by TRADE ANALYSIS

by LUTHER D. REED
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E. I. du Pont de Nemours & Co.
Wilmington, Del.

WHEN casting about for sources of market information, chemical companies are sometimes inclined to overlook a valuable possibility which is close at hand: their own salesmen.

There are various schools of thought concerning the use of salesmen for market research purposes. As is true of any disputable point, both sides have their arguments. However, it seems logical in the final analysis that, since the trade is in the care of the salesmen, it should be part of their duties to analyze personally its various developments and possibilities. As long as this form of analysis is naturally carried out mentally by salesmen anyway, it stands to reason that they should give others the benefit of their thinking through conveniently arranged reports.

SALESMEN KNOW THE TRADE

This seems logical, too, from the standpoint of good management. Daily trade reports from salesmen will provide management with a continuous stream of market knowledge. Such information will indicate trends, developments, acceptances, attitudes and market possibilities. Properly systematized, it will keep management fully informed concerning immediate customers, prospects, competitive activities, and the personalities involved in each. Finally, it will provide information about the salesman himself—his personality, his enthusiasm, his ability to analyze a commercial situation, and many other personal characteristics.

So that an idea may be gained of what is meant by a trade report, several representative samples are reproduced with this article. They show what type of information gathered in a routine way is necessary to a continuing analysis of trade from year to year.

One should bear in mind that these reports can be directed on specific occasions to concentrate on information necessary to the solution of a particular situation; and since the salesman has a greater knowledge of a product and a more practical appreciation of the business, he will usually constitute a much more intelligent interviewer than would a corps of outside agents.

The claim is frequently made that it takes too much of a salesman's time to write these reports. It is true that they are somewhat of a burden, and for this reason care must always be taken to see that the salesman is not asked to do any clerical work which could be performed by a clerical organization. Preparation of extra copies of reports should not fall on the salesman. He can be relieved of repetitive writing through various means. Recently, dictating machines have appeared on the market which operate from an automobile circuit or from the lighting circuit of a hotel room. They are of great assistance in the preparation of full reports.

It is thus not necessary for the salesman to spend an excessive amount of time in writing reports. One-half hour to one hour daily should be sufficient. Since in most instances it is undesirable to call on an account after 4 p.m., the time from 4 until 5 will provide full opportunity for study and report.

There is no mystery about the arrangement of a trade report. If management knows what information is required for the intelligent conduct of the business,

provision for gathering it can readily be arranged on a printed form.

One shortcoming in market research is this: Although a study is made which provides valuable information and very frequently points the way to the correction of certain weaknesses, repeat studies are generally not undertaken to determine what effect the correction brought about. Through the use of the salesmen, operating under a well-organized and directed system, continuous market research can be carried on which sets up an habitual knowledge of one's trade and provides the basis for routine, periodic summaries of happenings, effects, reasons and recommendations.

TRADE REPORTS HELP SALESMEN

Use of the trade report system also makes for a better selling organization. Where the selling activity is not tied into the field of market research, the salesman is inclined to wander. If his personal disposition or ambition on a particular day is below par, his tendency is to concentrate on the easier accounts where he is not going to encounter much resistance. But if he knows his management is in need of information and that he really has to work on various accounts, he will organize his day's program to the most effective end. Personal weaknesses will show up in the picture of his activities as evidenced by his reports.

As a part of an organization within the selling force, the salesman must have an objective when making each call, and this objective should be made part of his report. Approaching a specific account with such an objective, he must naturally organize his mind so that he will be in a position, after the interview is over, to write fully concerning the extent to which he achieved his objective or what assistance might be necessary to achieve it.

When all of the information from the trade reports of an entire selling force is sifted and organized, it provides a basis for a system of continuous trade analysis. Through such a system, a company is in a position to assay the future, so far as new or improved chemical requirements are concerned, without the need for a specific market study. Or, in reverse, when new or improved products are developed, the already existing trade information can readily point to immediate market possibilities.

In some circles, one will hear that salesmen object to writing reports. This may be true where the salesman has not been made to feel he is as much a director of sales in his immediate territory as the director of sales located in the headquarters office is over the whole selling activity. When the salesman is made to realize that the submission of such information is highly essential to good and intelligent sales direction, and that he becomes a part of management to the extent that he submits essential market information, he will cooperate readily. He must be made to realize that at times market information is more important than a sale. The fact should not be overlooked, however, that proper appreciation must be evidenced and expressed for his teamwork.

MANAGEMENT'S JOB

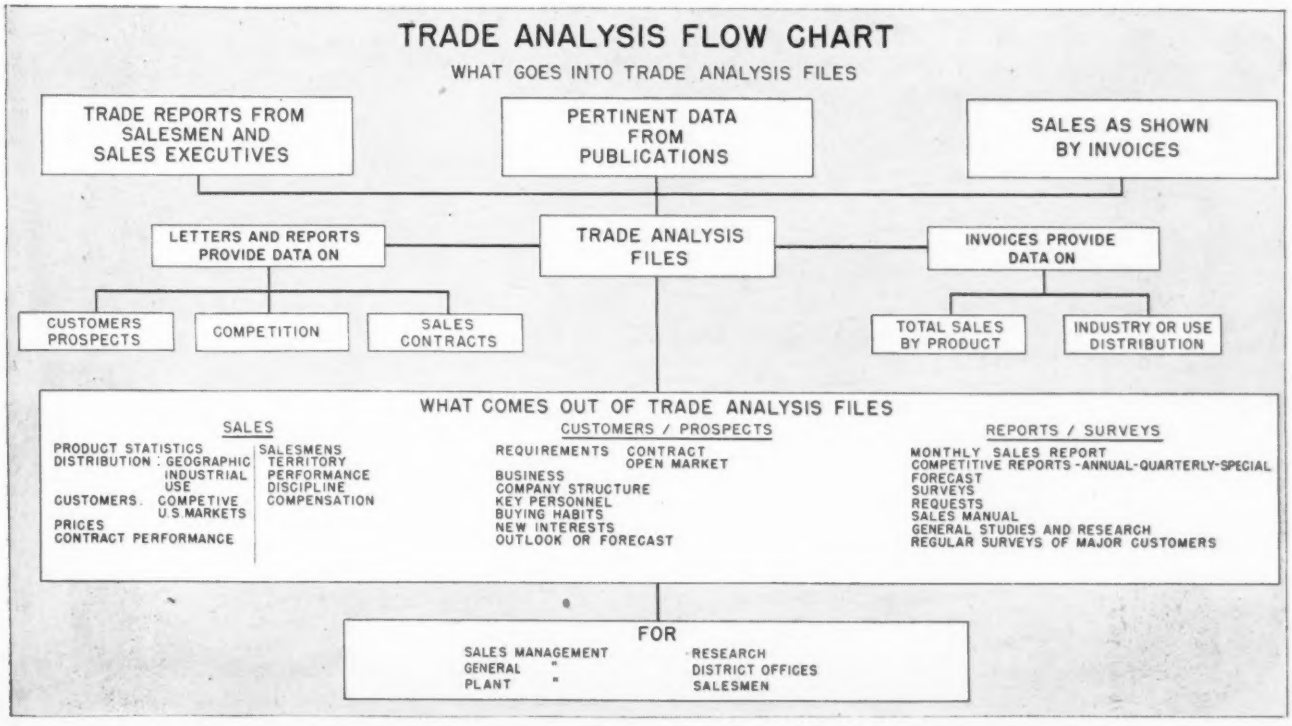
Thus far this article has emphasized only the salesmen's role in securing trade information necessary to chemical market research. Salesmen, of course, do not bear the entire responsibility. Sales management must contribute its help by way of intelligent direction and guidance. In fact, the use of the salesmen becomes a test of management as to whether it knows just what information is necessary to proper organization and complete analysis and control of its markets. Through the use of trade reports, management can so direct the thinking of its salesmen that the whole organization will have the same viewpoint as management itself, and so work as a thoroughly cooperative team whose members are all pulling in the same direction.

Management must keep salesmen interested in the importance of analysis so that the reports will never become too routine or commonplace. To do this, the form and questions must be changed from time to time. This is generally not a difficult task, as the type of information required is usually constantly changing. When personal contact occurs between management and field man, the matter of reports and trade analysis should always be a subject of earnest discussion.

In the handling of trade reports by the analyst, it is important that urgent matters be given prompt attention. This may be a problem if the volume of reports received is large. A simple system of taking care of the situation is to supply the salesmen with colored stickers which are to be attached to the margins of urgent reports. Immediately when such reports are noticed in a stack of papers, they are extracted and given first attention.

A trade report can affect or be of interest to a number of departments in a company other than the sales department. When this is the case, copies of the report are made and distributed to as many departments as seem indicated by the nature of the contents.

All of the foregoing concerns the collection of information. The next step



is what to do with it. This section of the work is largely mechanical, as contrasted to the ingenuity and originality that must be exercised in securing the basic information.

From here on the salesman's report is supplemented by other information, such as that obtained from trade publications, correspondence and, finally, invoices representing sales. Further supplemental information, such as contracts and records of official contacts, can constitute a historical file which in the long run sets up a complete picture of contacts with various customers and prospects over the years of acquaintance. All of this information can be stored in an ordinary file, arranged by salesmen's territories, and within each territory by state, city, and customer, in alphabetical order.

Experience indicates that this type of arrangement offers the most flexibility. Where a customer has locations in a number of territories, suitable cross-indexing can be arranged. The trade should be classified by importance to the company operating the analysis unit. This can be done on a basis of potential sales, either in dollars or other units that best fit the requirements of the seller. Units other than dollars are usually preferable because they do not change in their degree of meaning. Dollar figures, of course, are directly affected by prices.

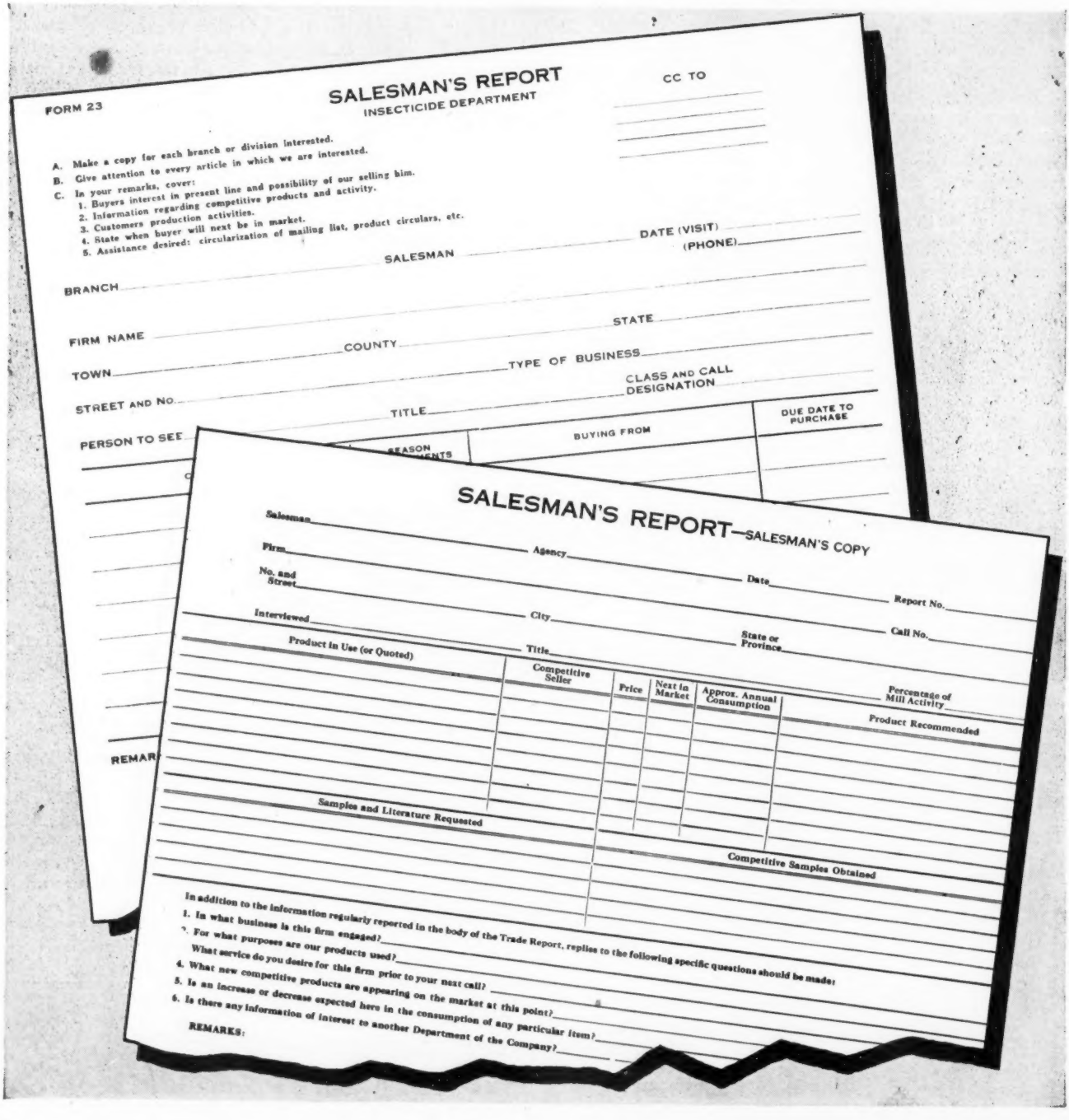
Invoices going into this file are recorded on a sales card by product, unit, and total money. One sales card covers a period of a year by months. At the end of a year, the information is transferred to a master card by years. A master card generally accommodates a period of ten years. The master card can also carry many vital statistics about the customer, such as location, nature of business, names of officials, associations, subsidiaries, etc.

USE IN MARKET RESEARCH

The current sales card gives opportunity for comparisons month by month or quarter by quarter, thus identifying buying habits of individual customers and providing opportunity to inquire immediately into the reasons for decreases or increases in purchases. The trade reports on file should, in most instances, provide this type of information. If they do not, the salesman can be approached for an explanation.

One can immediately appreciate the

Some samples of typical salesmen's report forms which provide space for market research information.



FORM 23

SALESMAN'S REPORT
INSECTICIDE DEPARTMENT

CC TO

A. Make a copy for each branch or division interested.
B. Give attention to every article in which we are interested.
C. In your remarks, cover:
1. Buyers interest in present line and possibility of our selling him.
2. Information regarding competitive products and activity.
3. Customers production activities.
4. State when buyer will next be in market.
5. Assistance desired: circularization of mailing list, product circulars, etc.

SALESMAN
DATE (VISIT)
(PHONE)
BRANCH
FIRM NAME
STATE
TOWN
COUNTY
TYPE OF BUSINESS
STREET AND NO.
CLASS AND CALL DESIGNATION
PERSON TO SEE
TITLE
REMAR
BUYING FROM
DUE DATE TO PURCHASE

SALESMAN'S REPORT—SALESMAN'S COPY

Salesman
Agency
Date
Report No.
Firm
No. and Street
City
State or Province
Call No.
Interviewed
Title
Product In Use (or Quoted)
Competitive Seller
Price
Next In Market
Approx. Annual Consumption
Percentage of Mill Activity
Product Recommended
Samples and Literature Requested
Competitive Samples Obtained
In addition to the information regularly reported in the body of the Trade Report, replies to the following specific questions should be made:
1. In what business is this firm engaged?
2. For what purposes are our products used?
What service do you desire for this firm prior to your next call?
4. What new competitive products are appearing on the market at this point?
5. Is an increase or decrease expected here in the consumption of any particular item?
6. Is there any information of interest to another Department of the Company?
REMARKS:

kind of control this type of record provides if it is properly used. Each account is further classified according to the industry it represents or, at times, the use of the product it buys. Here we come to what may be termed market research. On the basis of such a classification, studies can be conducted to show how sales are distributed over various industries and how strong the company's position is in each. Sales should always be well distrtibuted over a number of outlets, so as not to be too dependent on any given one.

In one instance known to the writer, the biggest dollar volume was being realized for a product very major in nature, but on analysis, it was found that this business was being procured in only two of six major consuming industries. Thus an important weakness was revealed in an otherwise strong position. A study of ways to assure an entreę into the four remaining industries was immediately launched, with the result that at the end of a two-year period a much better distribution of sales—and greater degree of security for the product—had been achieved.

There is always the tendency to put a lot of information in a file, but never get it out again for constructive use. Right here, an important point should be recorded: any trade analysis system or process of sales research is only as good as the individual in whose charge it is placed. That individual must possess vision and imagination and be able to sense trends and leanings that are indicated by the information he receives through the channels already mentioned.

In the trade analysis files there should be a complete record of sales contacts, with the salesman's opinions, views and findings as a result of these contacts. These records should include contacts with customers, prospects, and competitors. They should give basic information required for control of existing and prospective trade and, at the same time, provide basic data for specific studies regarding the distribution of certain products and the activity of certain industrial life in a trade. Buying and manufacturing habits should be included, to provide a foundation for approach to the trade with new products, improvements on old products, or replacements.

Expansion of plants, their outlook, new departures within an industry, all automatically go on file, but they never automatically come out of the files unless they are intelligently handled from a viewpoint of good sales management. It is apparent that the trade analyst must be an individual of broad mentality and vision, since in many instances he must think ahead of the sales manager, particularly from a statistical viewpoint. His outstanding function should be to do the statistical thinking for his management and assist in charting the company's course.

Dictating machines which operate on an automobile electrical circuit help salesmen speed their business intelligence to GHQ.

An analysis unit within an organization can become a very good training ground for salesmen. Here the objective and the viewpoint of management is always present. It provides a prospective salesman with the plan of operation of the business as a whole, and when he once gets into the field he automatically fits himself into that picture. There are numerous cases of where trade analysts have become sales executives as the result of their analytical experience and familiarity with the broader aspects of the field.

Digests of salesmen's reports may be made periodically for the benefit of general management, giving a summary of intersting items. This is one method whereby top management can be kept informed of interesting details. Such digests always mention the salesman's name. This helps build morale and also serves as an incentive to the salesman to make good trade reports.

Where a number of trained salesmen are making daily reports, it is easy to see that the trade report system can provide an extremely valuable day-to-day picture not only of one's markets but of the state of business and industry in general.

An endeavor has been made in this article not to write up a trade analysis system, but rather to present the fundamental concepts of something that can be a most useful business tool, as well as provide a foundation for a continuous, integrated program of market research. The point to be remembered is that thorough sales control, embracing all features of sales information, can be had only through the perfect teamwork of management, salesmen and analysts.

FLUIDIZATION OBSERVATIONS

THE following observations of some of the basic characteristics of fluidized solids in laboratory scale columns (1 to 4" dia.) were presented in a paper by Joseph D. Parent, of the Institute of Gas Technology, Chicago, at the recent regional meeting of the American Institute of Chemical Engineers at Louisville.

- The fluidization technique offers an excellent means of mixing suitably sized solids and bringing about presumably good contact between such solids and vapors.
- The drop in pressure due to gas travel through a bed of solids is practically independent of the velocity of the gas, porosity of the bed, cross-sectional shape of column, static pressure of gas, and viscosity and density of gas.
- The drop in pressure, expressed as loss in head, is very nearly equal to or slightly greater than the suspension or "hydrostatic" head of the bed. This may be considered a criterion of mechanically smooth fluidizing when visual observation is impossible. The head loss exceeds the predicted value when slugging occurs, and falls short of it when channelling occurs.
- Some materials which channel at low velocity, fluidize smoothly at moderate rates. If there is slugging, this generally becomes more violent with increased velocity.
- For tubes of 1 to 4" dia., fluidization is generally better as the vessel diameter increases. In the narrower columns there is a greater wall effect, which promotes channeling.
- For a given material there should be a balancing of coarse, medium and fine particles for smoothest operation. A preponderance of coarse material tends to promote slugging, while an excess of fines promotes channeling.
- The amount of material in the bed may be important. In general, increased bed height accentuates the tendency to slug or channel.
- The actual average linear void velocity at which fluidization starts is less than the free-fall velocity of the smallest particles.
- Just as the pressure drop across a bed can be calculated for a smoothly fluidizing system of known mass, so can the mass be calculated from a measurement of the pressure drop. With the aid of this principle the amount of material in a vessel can be kept at any desired value.
- The presence of fluidized solids in a gas stream probably does not greatly influence the rate of heat transfer to or from the walls of the vessel through which the gas is flowing.
- The fluidizing technique offers a means of rapidly bringing a gas to the desired reaction temperature and closely maintaining it at this temperature while in the reaction zone.

GLOSSARY OF CORROSION TERMS

THE STUDY OF CORROSION has become an integral part of chemical development and, as is the case in all developing fields, a nomenclature, consisting of new terms and new uses for old terms, has developed. To many the exact meaning of these terms is quite unfamiliar, if not completely unknown. To clarify this situation CHEMICAL INDUSTRIES here presents the definitions as established by a committee of corrosion experts.

THIS glossary was prepared for inclusion in the forthcoming *Corrosion Handbook*, sponsored by the Electrochemical Society and to be published by John Wiley & Sons, Inc., New York. It is the result of joint effort by the Editorial Avisory Board* of the *Corrosion Handbook* and Subcommittee V** of the American Coordinating Committee on Corrosion.

Acknowledgment is gladly made to the many investigators in the field of corrosion who contributed their special knowledge and advice to these definitions. Over a period of two years this list was periodically scrutinized by several groups with thought to its improvement and with concern to obtaining a reasonable cross section of expert opinion.

It is planned to revise and add to this list from time to time as the need arises. Suggestions and comments should be sent to W. E. Campbell, Bell Telephone Laboratories, Murray Hill, N. J.

A

AERATION CELL (OXYGEN CELL). An electrolytic cell, the emf of which is due to a difference in air (oxygen) concentration at one electrode as compared with that at another electrode of the same material.

AGGRESSIVE CARBON DIOXIDE. Free carbon dioxide in excess of the amount necessary to prevent precipitation of calcium as calcium carbonate.

ANAEROBIC. Free of air or uncombined oxygen.

ANION. A negatively charged ion of an *electrolyte*,† which migrates toward the *anode* under the influence of a potential gradient.

ANODE. The electrode of an electrolytic cell at which *oxidation* occurs. In corrosion processes, usually the electrode that has the greater tendency to go into solution. Typical anodic processes are *anions* giving up electrons; metal atoms becoming *ions* in solution or forming an insoluble compound of the metal; and the oxidation of an element or group of elements from a lower to a higher valence state.

ANODE CORROSION EFFICIENCY. The ratio of the actual corrosion of an *anode* to the theoretical corrosion calculated from the quantity of electricity which has passed.

ANODIC POLARIZATION. That portion of the *polarization* of a cell which occurs at the *anode*.

ANOLYTE. The electrolyte of an electrolytic cell adjacent to the *anode*.

C

CATHODE. The electrode of an electrolytic cell at which *reduction* occurs. In corrosion processes, usually the area that is not attacked. Typical cathodic processes are *cations* taking up electrons and being discharged, oxygen being reduced, and the reduction of an element or group of elements from a higher to a lower valence state.

CATHODIC CORROSION. *Corrosion* resulting from a cathodic condition of a structure, usually caused by the reaction of alkaline products of electrolysis with an amphoteric metal.

CATHODIC POLARIZATION. That portion of the *polarization* of a cell which occurs at the *cathode*.

CATHODIC PROTECTION. Reduction or prevention of *corrosion* of a metal surface by making it cathodic, for example, by the use of sacrificial anodes or impressed currents.

CATHOLYTE. The *electrolyte* of an electrolytic cell adjacent to the *cathode*.

CATION. A positively charged *ion* of an *electrolyte*, which migrates toward the *cathode* under the influence of a potential gradient.

CAUSTIC EMBRITTLEMENT. *Embrittlement* of a metal resulting from contact with an alkaline solution.

CAVITATION EROSION. Damage of a material associated with the formation and collapse of cavities in the liquid at a solid-liquid interface.

CHALKING. The development of loose removable powder at or just beneath a coating surface.

CHECKING. The development of slight breaks in a coating which do not penetrate to the underlying surface. Checking may be described as visible (as seen by the naked eye) or as microscopic (as seen under magnification of 10 diameters).

CHEMICAL CONVERSION COATING. A protective or decorative coating produced in situ by chemical reaction of a metal with a chosen environment.

COEFFICIENT OF CORROSION. The reciprocal of *anode corrosion efficiency*. A term used in applied *cathodic protection*.

CONCENTRATION CELL. An electrolytic cell, the emf of which is due to a difference in concentration of the electrolyte or active metal at the *anode* and the *cathode*.

CONCENTRATION POLARIZATION. That portion of the *polarization* of a cell produced by concentration changes resulting from passage of current through the *electrolyte*.

CONTACT CORROSION (CREVICE CORROSION). *Corrosion* of a metal at an area where contact is made with a material usually non-metallic.

CORROSION. Destruction of a metal by chemical or electrochemical reaction with its environment.

CORROSION FATIGUE. Reduction of fatigue durability by a corrosive environment.

CORROSION FATIGUE LIMIT. The maximum repeated stress endured by a metal

† Italicized words defined elsewhere in glossary.

without failure in a stated number of stress applications under defined conditions of *corrosion* and stressing.

COUPLE. A pair of dissimilar conductors in electrical contact.

COUPLE ACTION. See *Galvanic corrosion.*

CRACKING (OF COATING). Breaks in a coating which extend through to the underlying surface. Observation under a magnification of 10 diameters is recommended where there is difficulty in distinguishing between cracking and *checking.*

CRAZING. A network of checks or cracks appearing on a surface.

CRITICAL HUMIDITY. The relative humidity above which the atmospheric corrosion rate of a given metal increases sharply.

D

DEACTIVATION. The process of prior removal of the active corrosive constituents, usually oxygen, from a corrosive liquid by controlled corrosion of expendable metal or by other chemical means.

DECOMPOSITION POTENTIAL (OR VOLTAGE). The practical minimum potential difference necessary to decompose the *electrolyte* of a cell at a continuous rate.

DEPOLARIZATION. The reduction of counter-emf by removing or diminishing the causes of *polarization.*

DEPOSIT ATTACK. Corrosion occurring under or around a discontinuous deposit on a metallic surface.

DEZINCIFICATION. Corrosion of a zinc alloy, usually brass, involving loss of zinc, and a residue or deposit in situ of one or more less active constituents, usually copper.

DIFFERENTIAL AERATION CELL. See *Aeration cell.*

DRAINAGE. Conduction of current (positive electricity) from an underground metallic structure by means of a metallic conductor.

1. *Forced Drainage.* Drainage applied to underground metallic structures by means of an applied emf or sacrificial anode.

2. *Natural Drainage.* Drainage from an underground structure to a more negative (more anodic) structure, such as the negative bus of a trolley substation.

E

ELECTROCHEMICAL EQUIVALENT. The weight of an element or group of elements oxidized or reduced at one electrode of an electrolytic cell by the passage of a unit quantity of electricity. It is generally expressed in grams per coulomb.

ELECTROLYSIS. The production of chemical change in an *electrolyte* resulting from the passage of electricity.

ELECTROLYTE. A chemical substance or mixture, usually liquid, containing *ions* which migrate in an electric field.

ELECTROLYTIC CLEANING. The process of degreasing or descaling a metal by making it an electrode in a suitable bath.

ELECTROMOTIVE FORCE SERIES (EMF SERIES). A list of elements arranged according to their *standard electrode potentials,* the sign being positive for elements whose potentials are cathodic to hydrogen and negative for those anodic to hydrogen. (This convention of sign, historically and currently used in European literature, has been adopted by the Electrochemical Society and by the National Bureau of Standards, and is employed in this book. The opposite convention of G. N. Lewis has been adopted by the American Chemical Society.)

ELECTRONEGATIVE POTENTIAL. A potential corresponding in sign to those of the active or anodic members of the *Emf Series.* Because of existing confusion of sign in the literature, it is suggested that "anodic potential" be used whenever "electronegative potential" is implied. (See *Electromotive Force Series* [Emf Series].)

ELECTROPOSITIVE POTENTIAL. A potential corresponding in sign to potentials of the noble or cathodic members of the *Emf Series.* It is suggested that "cathodic potential" be used whenever "electropositive potential" is implied. (See *Emf Series.*)

EMBRITTLEMENT. Severe loss of ductility of a metal or alloy.

EROSION. Destruction of metal or other material by the abrasive action of liquid or gas. Usually accelerated by the presence of solid particles of matter in suspension and sometimes by *corrosion.*

EXFOLIATION. Scaling off of a surface in flakes or layers.

F

FILM. A thin, not necessarily visible layer of material.

FOGGED METAL. Metal, the luster of which has been sharply reduced by a *film* of corrosion products.

FRETTING CORROSION. *Corrosion* at the interface between two contacting surfaces accelerated by relative vibration between them of amplitude high enough to produce slip.

G

GALVANIC CELL. A cell made up of two dissimilar conductors in contact with an *electrolyte* or two similar conductors in contact with dissimilar electrolytes. More generally, a galvanic cell converts energy liberated by a spontaneous chemical reaction directly into electrical energy.

GALVANIC CORROSION. *Corrosion* associated with the current of a *galvanic cell* made up of dissimilar electrodes. Also known as couple action.

GALVANIC SERIES. A list of metals and alloys arranged according to their relative potentials in a given environment.

GRAPHITIZATION (GRAPHITIC CORROSION). *Corrosion* of gray cast iron in which the metallic iron constituent is converted into corrosion products, leaving the graphite intact.

H

HYDROGEN EMBRITTLEMENT. *Embrittlement* caused by entrance of hydrogen into the metal, as for example through pickling or cathodic polarization.

HYDROGEN OVERVOLTAGE. *Overvoltage* associated with the liberation of hydrogen gas.

I

IMPINGEMENT ATTACK. *Corrosion* associated with turbulent flow of a liquid. For some metals the action is considerably accelerated by entrained bubbles in the liquid.

INHIBITOR (APPLIED TO CORROSION). A chemical substance or mixture which, when added to an environment usually in small concentration, effectively decreases *corrosion.*

INTERCRYSTALLINE CORROSION. See *Intergranular corrosion.*

INTERGRANULAR CORROSION. Preferential *corrosion* at grain boundaries of a metal or alloy. Also called intercrystalline corrosion.

INTERNAL OXIDATION. The precipitation of one or more oxides of alloying elements beneath the external surface of an alloy as a result of oxygen diffusing into the alloy from an external source. Also known as subscale formation.

ION. An electrically charged atom or group of atoms.

L

LIQUATION. The process of separating a fusible substance from one less fusible by heat.

LOCAL ACTION. Corrosion caused by *local cells* on a metal surface.

LOCAL CELL. A cell, the emf of which is due to differences of potential between areas on a metallic surface in an electrolyte.

LONG-LINE CURRENT. Current (positive electricity) flowing through the earth from an anodic to a cathodic area which returns along an underground metallic structure. Usually used only where the areas are separated by considerable distance and where the current results from *concentration cell* action.

M

MATTE SURFACE. A surface with low specular reflectivity.

METALLIZING. The process of spraying a surface with a metal.

METAL REPLACEMENT. The deposition of a metal from a solution of its ions on a more anodic metal accompanied by solution of the latter metal. Also called "Immersion Plating."

MILL SCALE. The heavy oxide layer formed during hot fabrication or heat treatment of metals. Especially applied to iron and steel.

N

NOBLE METAL. A metal which in nature occurs commonly in the free state. Also a metal or alloy whose corrosion products are formed with a low negative or a positive free energy change.

NOBLE POTENTIAL. A potential substantially cathodic to the standard hydrogen potential.

O

OPEN CIRCUIT POTENTIAL. The measured potential of a cell from which no significant current flows in the external circuit.

OVERVOLTAGE. Difference between the potential of an electrode at which a reaction is actively taking place and another electrode at equilibrium for the same reaction.

OXIDATION. Loss of electrons by a constituent of a chemical reaction.

P

PARTING. The selective corrosion of one or more components of a solid solution alloy.

PARTING LIMIT. The maximum concentration of a more noble component in an alloy, above which *parting* does not occur within a specific environment.

PASSIVATOR. An *inhibitor* which appreciably changes the potential of a metal to a more cathodic value.

PASSIVE-ACTIVE CELL. A cell, the emf of which is due to the potential difference between a metal in an active state and the same metal in a passive state.

PASSIVITY.

Definition 1. A metal active in the *Emf Series* or an alloy composed of such metals is considered passive when its electrochemical behavior becomes that of an appreciably less active or *noble metal.*

Definition 2. A metal or alloy is passive if it substantially resists corrosion in an environment where thermodynamically there is a large free energy decrease associated with its passage from the metallic state to appropriate corrosion products.

PATINA. A green coating consisting principally of basic sulfate and occasionally containing small amounts of carbonate or chloride, which forms on the surface of copper or copper alloys exposed to the atmosphere a long time.

*p*H. A measure of hydrogen ion activity defined by

$$pH = \log_{10} \frac{1}{a_{H+}},$$

where a_{H+} = hydrogen ion activity = the molal concentration of hydrogen ions multiplied by the mean ion activity coefficient.

PICKLE. A solution or process used to loosen or remove corrosion products such as scale and tarnish from a metal.

PITTING EROSION. See *Cavitation erosion.*

PITTING FACTOR. The depth of the deepest pit resulting from corrosion divided by the average penetration as calculated from weight loss.

POLARIZATION. The production of counter-emf by products formed or by concentration changes resulting from passage of current through an electrolytic cell.

PRIME COAT. A first coat of paint originally applied to improve adherence of the succeeding coat but now frequently containing a corrosion *inhibitor.*

R

REACTION LIMIT. The minimum concentration of an alloy component below which appreciable attack of the alloy takes place in a given environment, but above which the alloy is corrosion resistant.

REDUCTION. Gain of electrons by a constituent of a chemical reaction.

RELATIVE HUMIDITY. The ratio, expressed as a percentage, of the amount of water present in a given volume of air at a given temperature to the amount required to saturate the air at that temperature.

RUSTING. *Corrosion* of iron resulting in the formation of products on the surface consisting largely of hydrous ferric oxide.

S

SCALING. The formation at high temperatures of partially adherent layers of corrosion products on a metal surface.

SEASON CRACKING. Cracking resulting from combined *corrosion* and internal stress. A term usually applied to *stress corrosion cracking* of brass.

SELF-CORROSION. See *Local action.*

SLUSHING COMPOUND. A non-drying oil, grease, or similar organic compound which, when coated over a metal, affords at least temporary protection against *corrosion.*

SPALLING. The chipping or fragmenting of a surface or surface coating caused, for example, by differential thermal expansion or contraction.

STANDARD POTENTIAL (STANDARD ELECTRODE POTENTIAL). The reversible potential for an electrode process when all products and reactants are at unit activity on a scale in which the standard potential for hydrogen is zero.

STRAY CURRENT CORROSION. *Corrosion* caused by current through paths other than the intended circuit or by any extraneous current in the earth.

STRESS CORROSION. *Corrosion* of a metal accelerated by stress.

STRESS CORROSION CRACKING. Cracking resulting from the combined effect of *corrosion* and stress.

SUBSCALE FORMATION. See *Internal oxidation.*

T

TARNISH. Discoloration of a metal surface due to formation of an adherent continuous *film* of corrosion products, usually sulfidic.

TUBERCULATION. The formation of localized corrosion products scattered over the surface in the form of knoblike mounds.

U

UNDERFILM CORROSION. Corrosion that occurs under lacquers and similar organic films in the form of randomly distributed hairlines (most common) or spots.

W

WELD DECAY. Corrosion notably of austenitic chromium steels at specific zones away from a weld.

THIOPHENE

(Continued from page 595)

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has the following composition which is indicated below:

Component	*Mol Per Cent*
Thiophene	99.0 Minimum
Carbon disulfide	1.0 Maximum
Benzene	0.1 Maximum

Hydrogen sulfide, carbon disulfide, and combined bottoms streams are not regularly processed further at present. In future operations these products may be marketed as produced, converted into marketable products, or processed by existing commercial methods to recover elemental sulfur.

The bottoms from the quench tower, mist filter, and batch still constitute the process residuum. The residuum contains 50 or more weight per cent of recoverable organic sulfur compounds. One of the most valuable components of the residuum is thiophene thiol. Recovery of this material will result in an ultimate output of thiophene thiol in excess 300 pounds per operating day.

The semi commercial unit, now in operation, has a capacity of 1000 pounds of thiophene per stream day or 300,000 pounds per year with an 80% operating factor. The thiophene product (99 per cent purity) is available in bulk quantities, in heavy steel 55 and 30-gallon drums, in 5-gallon steel cans, and in gallon and fractional gallon glass containers.

THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

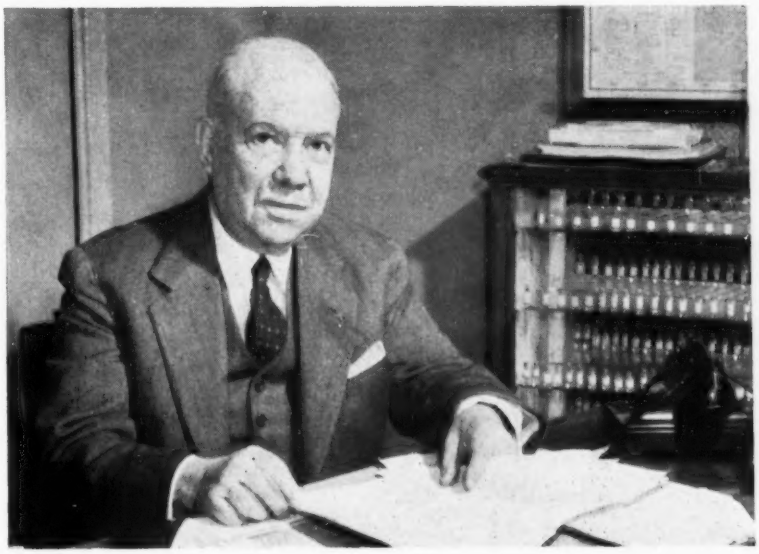
Bert R. Neice, elected vice-president, American Dyewood Co. He joined the company in 1932 and became a director in 1940.

Charles A. Thomas, Monsanto Chemical Co., named to receive the Industrial Research Medal. Presentation will be made on June 5.

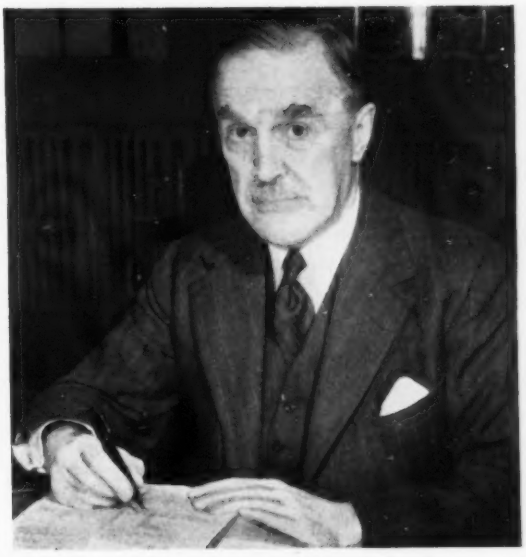
Fred W. Fraley, vice-president, Diamond Alkali Co., appointed a company director. He joined Diamond, as a salesman, in 1938.

Gen. J. C. Marshall, has joined the engineering staff of The M. W. Kellogg Co. He headed formation of the Manhattan Project.

Leo I. Dana, Linde Air Products Co., awarded the Schoellkopf Medal in recognition of his work in solving gas distribution problems.

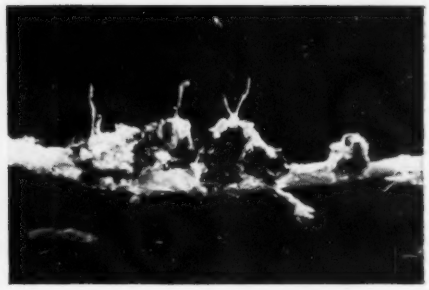


Charles A. Myers, formerly executive vice-president, Dodge & Olcott Inc., appointed president of the company. He has been with D & O for 40 years.

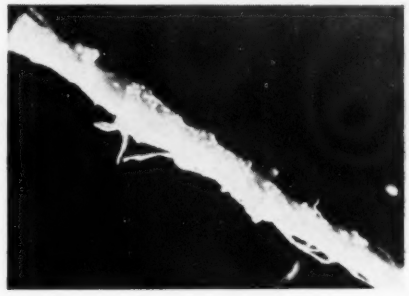


F. T. Dodge, named board chairman, Dodge & Olcott Inc. He is also a director of U. S. I. Chemicals Inc.

Scientist studies fungus under magnifying glass to determine stage of growth.



Deteriorating effect of fungi attack is clearly visible on this single cotton strand. (x 30)



Treated cotton strand shows no damage.

Mildew Fighting

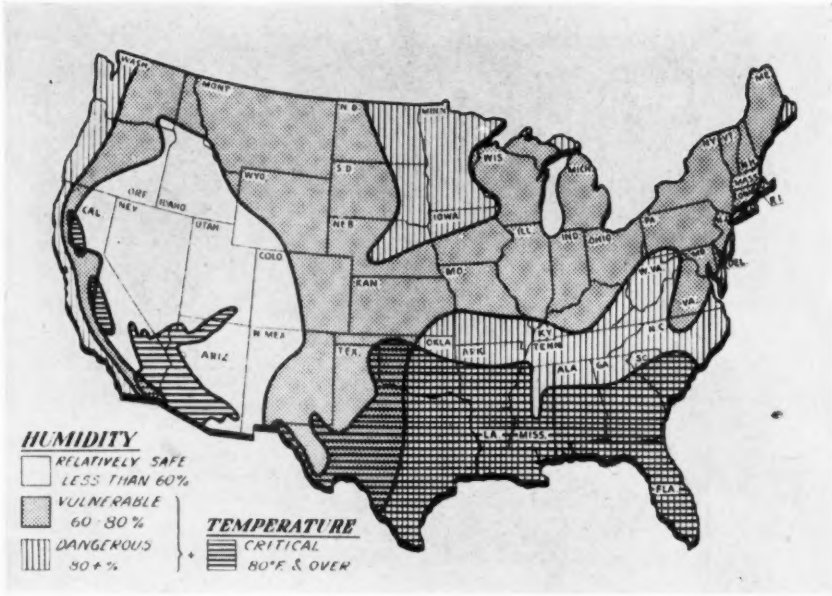
To many people mildew is merely the mold that forms on stale bread or old shoes. It is a nuisance encountered in the tropics, but of little moment in the U. S.

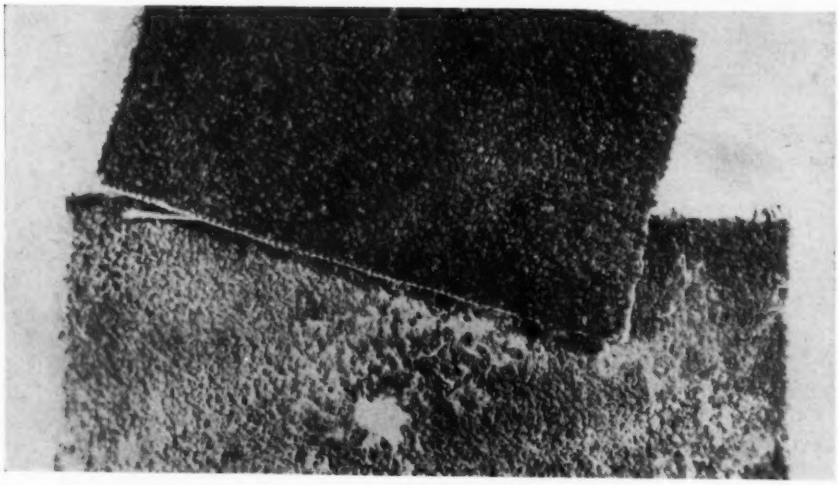
But that is far from the truth. Mildew damage is prevalent, but unrecognized.

More often than not, tents and awnings tear, firehoses burst, and leather goods fray, not through wear, but as a result of internal fungus-rot. Annual toll in the U. S.: at least $100 million annually. The map (right) points up the fact that 75 per cent of the U. S. is vulnerable to mildew attack in an average July.

There are three main types of fungicides in use at present: chlorinated phenols; mercurials; and metallic salts, such as copper naphthenate.

The pictures on this page, taken in the laboratories of Givaudan-Delawanna Inc., New York, illustrate the characteristics of one chlorinated phenol — dihydroxy-dichloro-diphenylmethane.





Two strips of rug after being kept in dark, humid chamber for three weeks. Analysis showed untreated portion (lower) had been attacked by trichoderma, aspergillus, and penicillium fungi. Humidity, not temperature, is key factor. Fungi flourish even at 45 F.

Book cover (half untreated, half mildew-proofed) after three weeks in dark, humid, atmosphere. Fungicide was brushed on.

Black powder charge is tamped into base of cardboard mortar. Fireworks company and N. Y. State Dept. of Labor developed the unit.

Clarence W. Schuler (right) examines metal pipe mortar. He suggested use of time-burst packet which explodes at any pre-determined height.

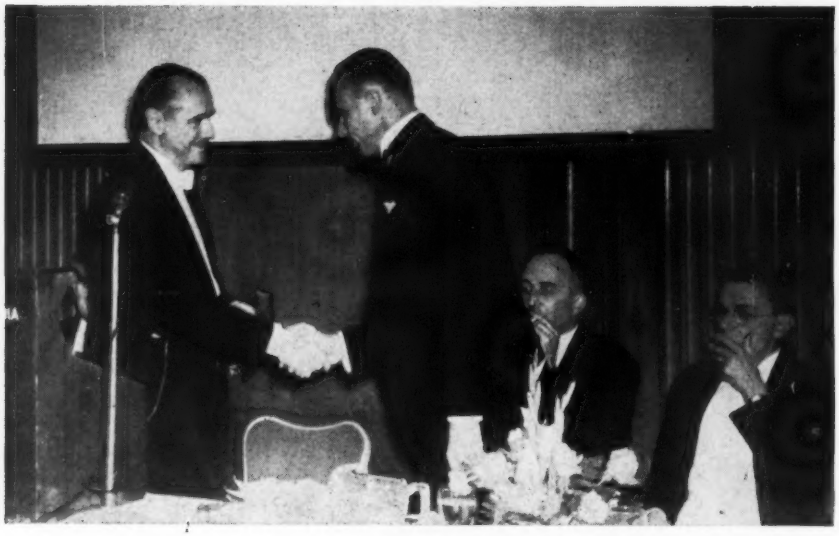
Double-barrel mortar sends twin bursts, one 45 feet high, the other 90 feet, to blanket tree on windward side with DDT pest-killer. Tree is too high for conventional spraying.

Novel Mortar Combats Tree Pests

Despite the development of many "miracle" insecticides, there has been one problem which has long perplexed orchardists—how to spray or dust the top branches of tall trees. Conventional spray rigs serve well in the extermination of insects pests on relatively small trees, and aerial spraying can be used to treat extensive orchards. But aerial spraying is expensive—and it is not economically sound to hire an airplane to dust a small clump, or a single, but nonetheless valuable, tree.

Recently, however, the New York State Dept. of Labor, working in conjunction with a fireworks manufacturer, has designed an insecticide mortar designed to treat single trees, and particularly the top foliage of taller stands.

Original experiments, carried through at Oak Hill Country Club, Pittsford, N. Y., involved the use of a six-inch pipe mortar, loaded with DDT and black powder. This was unsatisfactory on several counts—particularly in that a good deal of the insecticide was lost at the mortar muzzle. Since then a bomb has been designed, which can be exploded at any height, to blanket the tree-tops with DDT dust. Actually the cartridges can be made to burst at any height up to 1000 feet, but most have been set at 45, 60, and 90 feet. Ordinarily the insecticide is released as near the top of the tree as possible, so that the dust sifts down through the upper foliage.



George B. Kistiakowsky (right) receives the Nichols Medal from V. du Vigneaud, Cornell.

Mrs. Kistiakowsky, honored dinner guest.

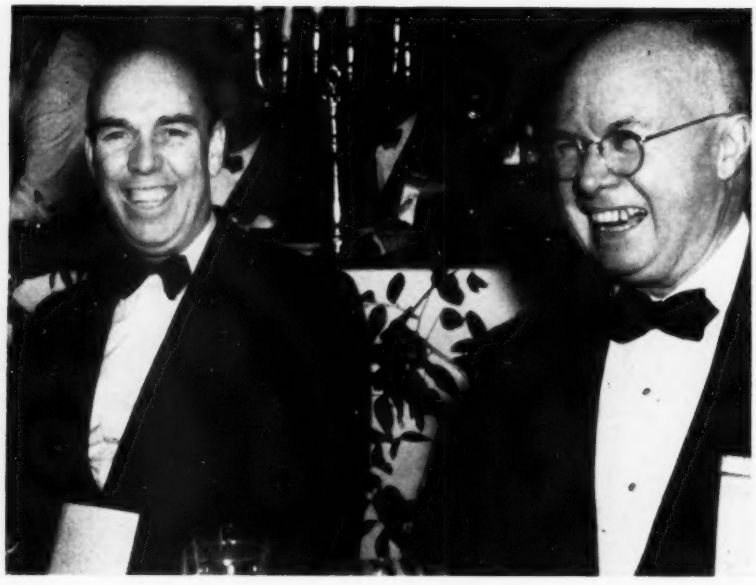
Kistiakowsky Wins Nichols Medal

The New York Section of the American Chemical Society met jointly with the Society of Chemical Industry on March 7 to honor George B. Kistiakowsky, Harvard University for "outstanding contributions in the field of reaction kinetics, spectroscopy of polyatomic molecules, and heat effects in organic reactions."

James B. Conant, addressed the meeting and paid tribute to Prof. Kistiakowsky as a man, while W. Albert Noyes, Jr. outlined the scientific achievements of the medallist.

James B. Conant, president, Harvard University (left) and W. A. Noyes Jr., president, A. C. S.

DCAT Dinner



Pictured above at the annual dinner of the Drug, Chemical and Allied Trades Section of the New York Board of Trade, held at the Waldorf-Astoria, Mar. 13th, are: Ralph Dorland, Dow Chemical Co., chairman of the Board of Trade; C. C. Concannon, Chief, Chemicals and Drugs Section, U. S. Dept. of Commerce; Hon. Owen Brewster, U. S. Senator from Maine, and featured speaker; and Carle M. Bigelow, Calco Chemical Co., chairman, DCAT Section. More than 2200 drug and chemical men attended the banquet.

LABOR RELATIONS

by NATHAN C. ROCKWOOD

Pyramiding of Overtime Pay

This is a method, based on contract technicalities, that is being seized upon by unions to maintain take-home pay on a shorter work week. It can be avoided only by drawing up a contract that is incapable of more than one interpretation

WITH return to peace-time operation, employers are attempting to reduce war-time labor costs by rearranging work schedules to avoid overtime. This leads to clauses in collective bargaining contracts on conditions of employment which may result in disputes as to their interpretation.

Interpreting "Seventh Day"

Apparently nearly all present union contracts contain clauses similar to the following: "The regularly scheduled work week shall be five consecutive days of work and two days of rest. All work performed on the sixth consecutive day of the work week shall be paid for at one and one-half times the regular rate of pay, and double-time shall be paid for all work performed on the seventh consecutive day of the work week." The question arises as to the meaning of the term "seventh consecutive day of the work week."

Employers, naturally, because it was their understanding of the reason for this clause, have tried to interpret it to mean that when an employee had already worked five days, or 40 hours, in any one week, he was to be paid time and one-half for the sixth work day (usually a Saturday) and double-time for work on the seventh work day (usually but not necessarily Sunday).

Not inclined to miss a trick, and probably advised by clever lawyers, employees contend the clause means that an employee who works on Sunday, or the seventh day, is entitled to "pyramid" his overtime. In other words, he is to be paid time and one-half for straight overtime plus double-time for his Sunday work, thus getting the premium both ways. The arbitrator finds that such contract clauses are clear in providing "double-time" for Sunday or seventh day work, and the fact that the employee had at least one day a week off, according to schedule, made no difference.

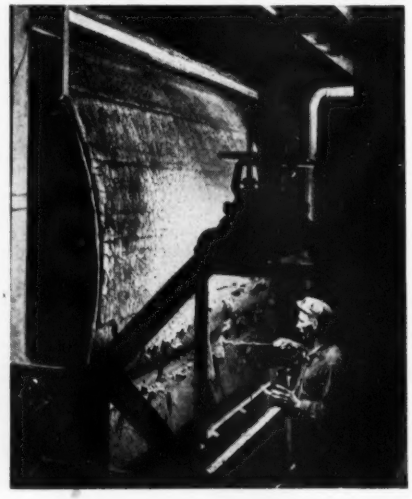
Ban on Pyramiding Ineffective

Naturally, some employers have foreseen the possibility of pyramiding overtime pay, and in the case of the Monsanto Chemical Co. (Springfield, Mass., plant) and a C.I.O. United Electrical, Radio and Machine Workers' union, the contract contained a special ban on such pyramiding, which was worded as follows: "In no case shall overtime be paid twice; that is, if the time worked falls under two or more of the overtime classifications, the rate paid shall be the single overtime applicable."

The union's case was that of an employee who had worked six consecutive days, one of which included premium pay because the worker was called to work outside of his regular shift hours on that day, and, the union contended, he was also entitled to premium pay for the sixth consecutive day. The particular clause referred to provided: "Any shift worker called to work at any time other than his regular shift shall be paid overtime for the hours worked outside of his regular shift, unless notified 18 hours in advance."

The difficulty arose when the employee's overtime on his unscheduled shift overlapped into the sixth work day. The union contended this entitled him to both the time and one-half for his unscheduled shift and time and one-half for the sixth day.

The key clause in the contract was (in part) this: "Time and one-half shall be paid for all work performed on the sixth consecutive day of work in a regularly scheduled work week. In order to be entitled to this premium rate of pay on the sixth day, the employee must have worked a full shift on each of the five preceding days of the regular work week," except for specified reasons.



The high cost of overtime is a problem of those industries which require 24-hour a day, 7-day a week operation.

The facts were these: The worker was scheduled to work a five-day week Monday to Saturday with Tuesday off. He was asked, because of special circumstances to work an additional shift after completing his regular Monday's shift, which ended at 11:00 p.m. he worked until 7:00 a.m. Tuesday, receiving time and one-half.

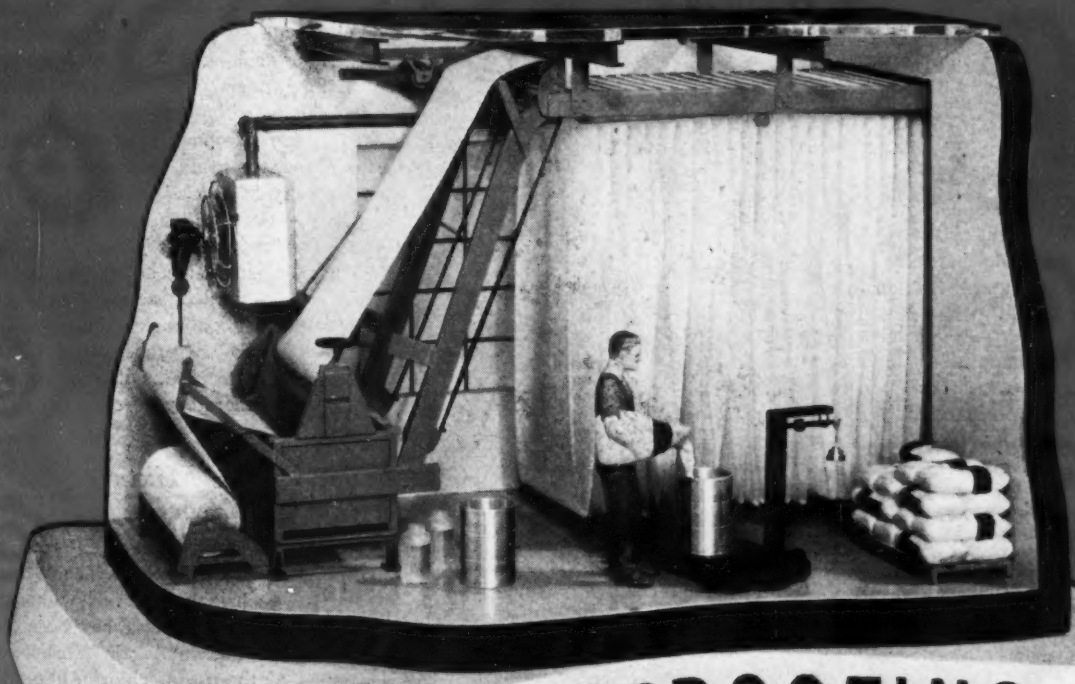
The arbitrator held "that the premium pay for the hours worked in excess of eight in any 24-hour period may not be counted against overtime due for the sixth consecutive day worked, so long as each premium is due for a separate and distinct day. The contract clause in regard to the duplication of overtime pay definitely refers to two or more classifications for overtime worked on one day."

In a case involving the Pittsburgh Plate Glass Co. and the Libbey-Owens-Ford Glass Co. and the Federation of Glass, Ceramic and Silica Sand Workers of America (C.I.O.) the arbitrator decided that pyramiding for Sunday work was permissible under the terms of the union contract.

The overtime clause read: "A normal work week shall be 36 hours. No employee, except as herein provided otherwise, will be required to work more than 40 hours nor more than six days in any scheduled work week, nor more than eight hours in any 24-hour period without payment of overtime." It provided further that: "Employees who are working on a regularly scheduled day of eight hours or more shall receive time and one-half for the sixth consecutive day worked in the scheduled work week." There was also the usual provision that Sundays (and certain other days named) are regarded as holidays. Overtime will not be paid for these holidays for work required in the continuous processing, or for repairs of an emergency nature essential to factory operation, except for Christmas Day (and other named holidays, not mentioning Sundays). "If, however, emergencies arise where work on Sundays or any of the holidays stated is required to fill emergency orders, or to avoid hiring temporary employees during the rush season, it is agreed that Sunday and holiday work may be carried on provided overtime is paid on such Sundays and holidays for this emergency work in getting out orders."

The union maintained that its members engaged in non-continuous operations when required to work on Sundays, and so were entitled to overtime for all hours in the week exceeding 40, plus the overtime pay for Sunday as such. This position was sustained by the arbitrator.

VICTOR *Chemicals*



for... FLAMEPROOFING

Today, phosphate of ammonia is generally recognized as the most effective flameproofing agent for highly combustible cellulose fibers. When used to flameproof textiles and paper, solutions of Victor Ammonium Phosphate are usually applied by dipping, spraying, or brushing. In treating wood and timber, ammonium phosphate solutions are usually applied under pressure in autoclaves. ¶ Victor Chemicals used in flameproofing include: **Diammonium Phosphate** (pH of 1% solution 8.0), **Monoammonium Phosphate** (pH of 1% solution 4.5), **Fyrex** (a neutral crystalline ammonium phosphate), **Flexible Fyrex** (also a neutral product to which softening agents have been added to prevent treated materials from adhering to drying rolls, plates, or forms, and to preserve flexibility), **Special Flexible Fyrex** (provides rapid penetration because of added wetting agents and preserves flexibility by inhibiting the growth of large crystals on drying).

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NEW PRODUCTS & PROCESSES

Silicaceous Flatting Agent NP 470

An improved gloss reducing agent for lacquers and varnishes is being offered by Monsanto Chemical Co.

The new product, a powdery silica, is said to impart a desirable sheen to furniture rather than a high gloss, and increases resistance to marring.

Santocel, as the product is called, is porous and spongelike, obtained by dehydrating a gel without shrinkage of the skeletal structure. The individual particles, averaging 4 microns in diameter, are made up of unoriented fibers of 25-35 Angstroms probable diameter separated by spaces of 400 Angstroms. A given volume of the material contains 94 per cent air.

The earlier Santocel had a particle size of 30 microns, and these particles, small as they were, did not disperse rapidly enough in finishes.

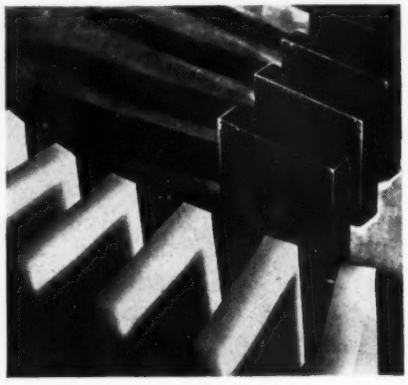
The new product solves that problem, and the finishes dry to the desired luster. The individual particles project through the surface and scatter reflected light, but they are so small that they do not affect the smooth feel of the surface.

Microcrystalline Wax NP 471

Sun Oil Co. has introduced a new product, Sunwax 1290. It is a relatively hard, non-brittle, non-sticky petroleum wax of the microcrystalline type.

Sunwax is made in both yellow and brown grades. Both have melting points of 175°-185° F., a penetration of 15 maximum, and are otherwise similar in general properties.

The individual crystals in Sunwax 1290 are extremely small, making a film or layer of the product highly uniform and therefore offering excellent protection against the passage of moisture. Because Sunwax has a high melting point, it provides such protection at temperatures far above normal for ordinary waxes. Moreover, its greater resiliency or resistance to shattering makes Sunwax an ideal protective agent at temperatures encountered in commercial and domestic refrigeration.



Sunwax is particularly well suited for the protective lining of paper, wood or metal containers where contact between the contents and containers is undesirable. The high tensile strength of the new Sun product, together with its hardness, frequently imparts added mechanical strength to articles coated or impregnated with it.

Modified Starches NP 472

A "vulcanized" starch, resistant to the swelling action of heat and chemicals has been developed by the research department of National Starch Products, Inc.

Vulca starches are available with various degrees of non-swelling and non-gelatinizing characteristics; thus they are suitable for a variety of industrial purposes.

Wide-spread use of these partially treated starches is suggested by a number of possible applications—as printing thickeners in textile operations, certain cosmetic creams, electrolyte carriers in dry-cell batteries, or as ingredients for pressured soups in the food field. In the printing and paper trades, Vulca starches are adaptable as dusting powders, beater sizings, or as additives to tub sizings.

The completely vulcanized starch, known as Vulca-100, answers industrial requirements for an inert, non-toxic organic filler or ingredient. It can be cooked in boiling water or a five per cent alkaline solution without increasing its average granule size more than five microns. Approximately neutral in water suspension, the starch settles after cooking because the granules are not appreciably swollen or ruptured.

The product is non-toxic and is not rapidly hydrolyzed by acids or enzymes. Steam sterilization makes no essential change in any of the properties of Vulca-100, according to National's development and testing laboratory.

Cl and ClO_2 Mixture For Pulp Bleaching NP 473

The use of a mixture of chlorine dioxide and chlorine gases to bleach kraft pulps to high brightness levels with substantially no strength loss has been described by Mathieson Alkali Works.

Results of the use of chlorine dioxide-chlorine mixtures are similar to those obtained with pure chlorine dioxide, not only in the brightness level and strength retention achieved, but also in the rapid rate of bleaching action and in the absence of need for careful operating controls. For large scale pulp bleaching, therefore, the use of the mixed gases offers economic advantages over chlorine dioxide alone.

In experiments with the mixed gas bleaching process on northern, southern, and Swedish kraft pulps, the results obtained with the gaseous mixture compared favorably with those obtained when pure chlorine dioxide was used, and showed the expected advantages over hypochlorite bleaching.

Pentamethylene Chloride NP 474

A new product which should find use as a chemical intermediate in organic syntheses is pentamethylene chloride (1,5-dichloropentane). It is a colorless, mobile liquid with a mild, pleasant odor. Molecular weight is 141.04 and specific gravity, 1.102. Insoluble in water, it is

He talked *Chlorine* into an industry

"A great talker"—so a biographer describes James Watt, brilliant father of the steam engine. One can almost visualize him as he regaled his father-in-law, MacGregor, with the time-saving advantages of using "oxygenated muriatic acid" in his bleach works. Chlorine was thus talked into the first commercial bleaching application—an application that changed the entire character of an industry.

From this experimental beginning, the bleaching powers of Chlorine have been utilized with inestimable value in the textile and paper industries. In its comparatively new role as the versatile tool of chemical synthesis, Chlorine is helping to bring many new refinements to our civilization . . . a civilization it has protected from pestilence through its well-known germicidal properties.

Columbia, with its associates, is the nation's largest merchant producer of Liquid Chlorine.

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soluble in ethanol, ethyl ether, chloroform, carbon disulfide, benzene, petroleum ether, and most of the common organic solvents.

1,5-Dichloropentane contains two reactive chlorine atoms, which can be replaced by cyanogen, amino, sulfur and other groups. Reaction with ammonia gives the dihydrochloride of pentamethylene diamine, which upon heating in the dry state cyclizes to form piperidine hydrochloride. By heating 1,5-dichloropentane in an alcoholic solution of potassium sulfide, tetrahydrothiopyran can be obtained. This product can be oxidized with dilute nitric acid or potassium permanganate to form pentamethylene sulfoxide and pentamethylene sulfone. With aluminum chloride as catalyst 1,5-dichloropentane can be made to yield a high molecular weight auto-condensation product, which is said to act as an effective pour-point depressor for waxy mineral lubricating oils. Pentamethylene chloride is available at present in limited quantities from Electrochemicals Department, E. I. du Pont de Nemours & Co., Inc.

Plastic Compounding Process NP 475

A new process for the compounding of thermoplastic materials, which is applicable to practically all substances requiring the addition of a liquid plasticizer, eliminates the use of solvents and slurries, as well as the usual steps of combining the materials into a fused mass mechanical working, hardening, and grinding.

The flake or resin, dye, pigment stabilizer, extender, and filler are charged into a compounding chamber which is rotatably mounted. During rotation, the plasticizer and other liquid additives are spray-injected into the chamber, after which the material is dehydrated by filtering hot dry air through it as the chamber continues to rotate. The product, which remains in powder form throughout the process, is then ready for feeding into standard molding and extruding equipment.

The process is available on a licensing and royalty basis. Equipment utilizing the process, under the name of Plastimaker, is now being manufactured in 40, 150, 300, 600, and 1000-pound capacities by the Hungerford Plastics Corp.

Sulfur Compounds NP 476

Two new organic chemical intermediates are offered by B. F. Goodrich Chemical Company.

2-Amino ethyl sulfuric acid is a white crystalline material of extremely high purity, readily soluble in water but insoluble in most organic solvents. It should find wide usage as an intermediate in the preparation of heterocyclic nitrogen compounds such as ethylene imine and other ring systems containing both sulfur and

Emulsion Chemicals *for*

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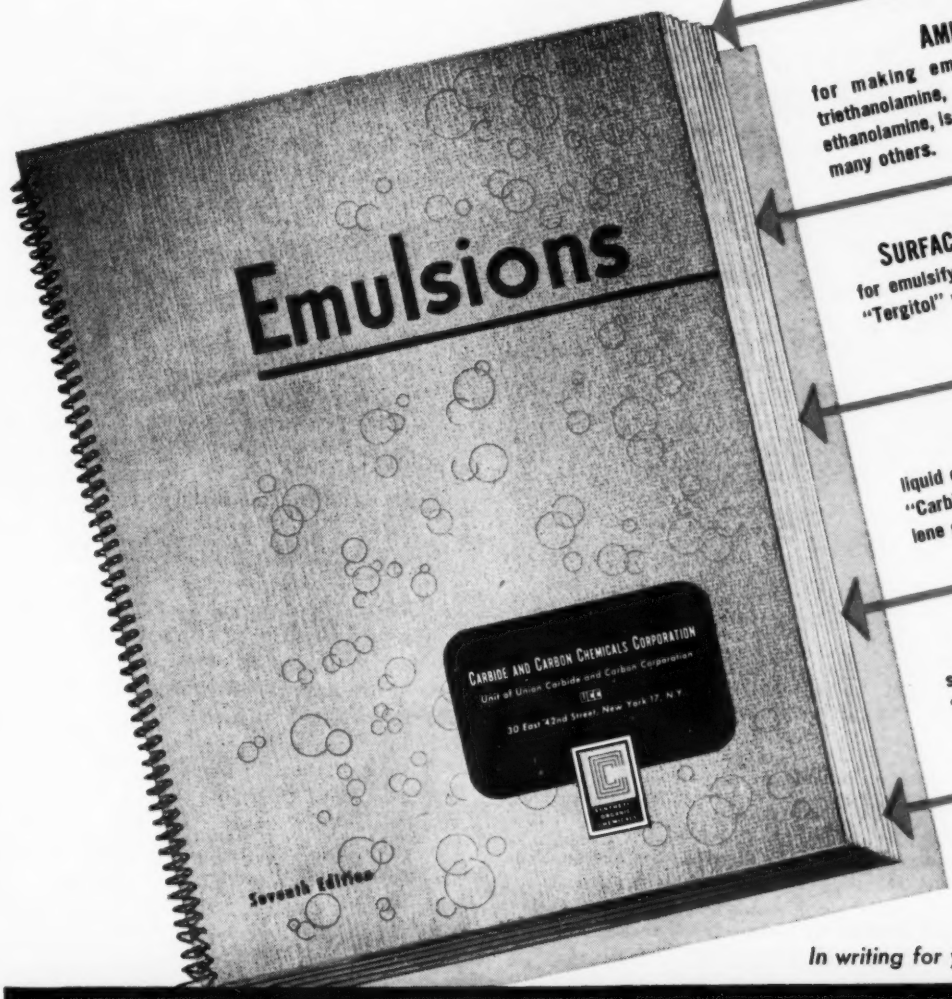
- cosmetics
- floor waxes
- shoe polishes
- textile oils
- leather finishes
- water paints
- pharmaceuticals
- shampoos
- cutting oils

The seventh edition of our "Emulsions" book, containing suggested formulas and methods of emulsifying industrial oils, fats, waxes, and greases, has just been printed. This 72-page book includes complete information on the use of our chemical products in recently developed emulsion formulas:



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nitrogen. Since amino ethyl sulfuric acid will react with most compounds containing an active hydrogen atom, the material is widely applicable as an amino-ethylating agent.

Rhodanine (2-thio-4-keto-thiazolidine) is a heterocyclic compound containing a reactive methylene group. Crystalline in nature, it is pale yellow in color. The material is soluble in alcohol, ether, alkali and hot water. Rhodanine reacts readily with aromatic aldehydes and the resulting derivatives are useful as intermediates for the manufacture of arylamino acids, arylthiopyruvic acids, arylacetic acids, arylacetonitriles and arylethyl amines, all with unusually high yields. Many other reactions will be suggested by the chemical structure of rhodanine.

Not previously offered as commercial materials, these two intermediates should make practical many syntheses heretofore considered only from academic standpoints.

Dimethyl Hydantoin NP 477

Dimethyl hydantoin (acetonyl urea) is an odorless, white, crystalline solid with a molecular weight of 128.13 and melting point of 178° C. It is readily soluble in water, ethanol, diethyl ether and ethyl acetate; moderately soluble in isopropanol, acetone, and methyl ethyl ketone; and insoluble in hydrocarbons and trichloroethylene. Its formula is

$$(CH_3)_2CNHCONHCO.$$
$$\qquad\qquad\quad|\_\_\_\_\_|$$

Although not essentially changed by boiling with hydrochloric acid at atmospheric pressure, when heated with fuming hydrochloric acid at 150°-160° C. dimethyl hydantoin is split to form α-amino-isobutyric acid, ammonium chloride and carbon dioxide. Reaction with boiling acetic anhydride gives the 1-acetyl derivative and a trace of the diacetyl derivative. Treatment with dilute sodium or barium hydroxide gives a salt of α-ureido isobutyric acid.

The reaction of dimethyl hydantoin with formaldehyde can be controlled to give either monomethylol-dimethyl hydantoin or methylene-bis-dimethyl hydantoin or a series of resins.

It is now available in small quantities from Electrochemicals Division, E. I. du Pont de Nemours & Co., Inc.

Aromatic Solvents NP 478

Esso Marketers are offering a new, high-boiling, pure aromatic solvent known as Solvesso #150. This product is similar to the now discontinued Solvesso #3, but richer in aromatics. It is higher boiling than the other new aromatic solvent known as Solvesso #100, which was also recently made available.

Both products are available in tank cars or drums for immediate delivery. Solvesso #150 is useful for improving

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America's Leading Synthetic Detergent

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For years the price of NACCONOL NR has gone steadily downward. Today it costs two-thirds less than in 1932! You will continue to benefit by our greater production and technology.

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flow-out in lacquers or synthetic enamels, and is of particular interest in baking enamels. Other applications are for silk screen work, lithographic varnishes, wire enamels and similar applications where a combination of high flash point and slow evaporation rate is required.

The typical properties of these two new aromatic solvents are as follows:

	Solvesso #100	*Solvesso #150*
Composition (approx.)		
Aromatics	99.5%	95%
Aliphatics	0.5%	5%
Specific gravity at 60°F/60°F.	0.875	0.890
Weight lbs/gal. at 60°F/60°F.	7.28	7.41
Color, Saybolt	+30	+25
Odor	Mild Aromatic	Faint, Pleasant
Aniline point (mixed) °C.	11.5	20
Kauri-Butanol value (Toluol = 100)	90	82
Flash, tag c.c., min. °F.	100	150
ASTM Distillation		
I.B.P.	313°F.	372°F.
10%	318	376
50	325	380
90	328	385
95%	340	387
F.B.P.	344°F.	396°F.
Evaporation Rate (Modified Jolly balance at 35°C.)		
15 minutes	6.0%	1.5%
60 minutes	26.5	9.0
120 minutes	51.0	19.0
180 minutes	72.5	28.0
240 minutes	92.5%	37.0
260 minutes	100%	....
420 minutes	.....	60.0%

Filtration Process NP 479

A new method of purifying cane sugar and other products, designated as the Percofil process, was described to the British Society of Chemical Industry in London by Leonard Wickenden, consulting chemist for The Mathieson Alkali Works. The process makes it possible to use activated carbon in the conventional gravity type filter. This new development, it was stated, reduces costs and improves the purity of the product. It also appears to offer advantages to other users of activated carbons, and interesting results are said to have been demonstrated in corn sugar refining and on mineral oils.

Most cane sugar is now refined by percolation through a bed of animal charcoal, or bonechar, Mr. Wickenden explained. The use of "activated," or vegetable, carbon has long been considered desirable, but it has been adopted by few refineries because the equipment used for bonechar filtration would have to be replaced with equipment suitable for activated carbon filtration.

According to Mr. Wickenden, the Percofil mixture is produced by suspending activated carbon on the surface of an inert carbonaceous carrier. This mixture is then used in the gravity type of filter heretofore used with bonechar and procedure follows along the lines of general bonechar practice.

Passage of the sugar down through the Percofil mixture, as the increasingly pure liquor comes in contact with the cleaner carbon in the lower layers, gives the effect of a great number of "countercurrent" filtrations, typical of the two- or

three-stage systems used with ordinary (finely divided) activated carbon.

The process is also said to be economical with respect to consumption of activated carbon. To effect the desired color removal, Percofil filtration requires only about 50% of the amount of activated carbon needed for a single filtration with finely divided carbon.

Heat-Resistant Concrete NP 480

A concrete which easily withstands temperatures as high as 3000° F. has been developed by The Babcock & Wilcox Company. Known as "B & W Kaocast," the product fills a need for a refractory castable in the construction of industrial furnaces operating at temperatures ranging from the top limit of standard refractory castables up to as high as 3000° F.

Both in service trials and in laboratory tests, the material has shown excellent stability and resistance to disintegration under repeated heating and cooling cycles. Other properties which give Kaocast its durability include its exceedingly small volume change on initial firing, and its lack of shrinkage or expansion under continuous use at high temperatures.

Because it can be either poured into place like ordinary concrete used in construction work, or used as a ramming mixture, B & W Kaocast will effect considerable savings in furnace construction. This is particularly true of furnaces requiring extensive use of special shapes which were formerly made of kiln-fired materials or of refractory plastics. Kaocast can be used either for the quick fabrication of these special shapes, or to form part or all of the furnace lining.

Other applications, listed by The Babcock & Wilcox Company, where Kaocast will cut down construction time and reduce furnace maintenance, include its use as a covering for studs in water-cooled furnace walls, in forming high temperature baffles, and for furnace car tops, which are subjected to repeated heating and cooling cycles. Because its volume change is negligible under high temperatures, Kaocast is ideal for patching brickwork.

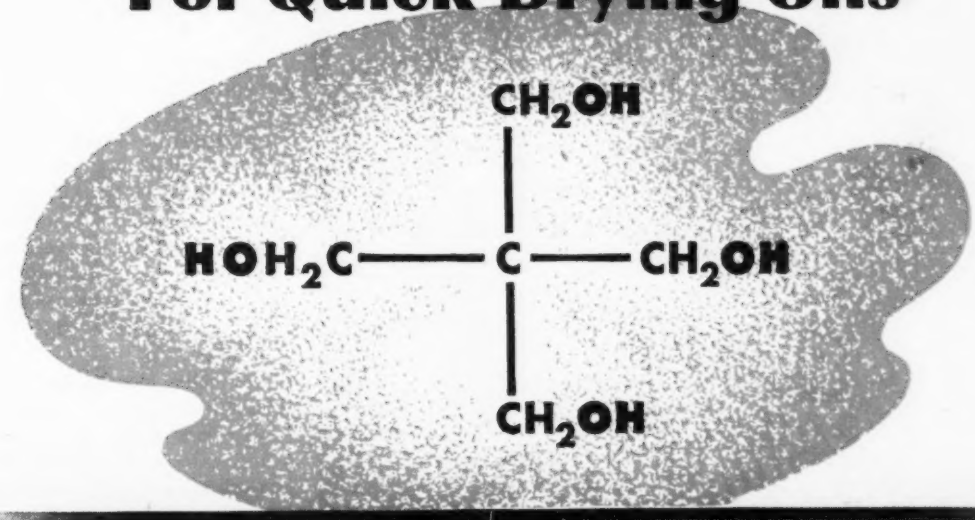
The material is supplied in dry form, ready mixed, and requires only the addition of water to make it ready for use.

Coating for Metals And Concrete NP 481

Vinaline, an internally plasticized synthetic coating, has been developed by the Carboline Co. to protect metal and concrete from mineral acids, solvents, and mixtures of the two at all temperatures from —40° F. to 160° F. In addition, it is a specific coating for sodium hypochlorite and caustic soda.

At these temperature ranges Vinaline

For Quick-Drying Oils



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Pentaerythritol, Technical Grade

Pentaerythritol drying oils are noteworthy for

● Quick drying ● Quick bodying ● High gloss ● Water resistance ● Good aging qualities ● Hardness of film ● Toughness of film.

Pentek finds valuable application in coating compositions of alkyd, urea-formaldehyde, and modified phenolic resins . . . in plasticizers, emulsifying agents, and waxes . . . and as a glycerol replacement.

AVAILABILITY: 75-lb. multi-wall paper bags.

Technical literature will be sent upon request.

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FINE HEYDEN CHEMICALS

is resistant to all concentrations of sulfuric acid up to 80%, nitric acid up to 35%, hydrochloric acid up to 35%, sodium hypochlorite up to 10% and caustic soda up to 25%. At temperatures under 100° F. it has shown good resistance to 93% sulfuric acid, 65% nitric acid and 50% caustic soda.

Two coats of Vinaline finisher and one of primer provide an impervious coating with no pinholes. The moisture absorption at 70° F. is 1.04% in 24 days. On wire brushed or sand-blasted surfaces Vinaline coatings have a bond of 400 lbs. per square inch; on new concrete or old treated concrete, a bond of 500 lbs. per square inch; on wood, 600 lbs. per square inch.

Vinaline may be used to protect pumps, cast iron bases, concrete foundations, instrument panels, process and utility piping, exterior surfaces of tanks, structural steel supports, concrete foundations and conduits (at point of floor emergence).

Vinaline H, a harder and less flexible coating than regular Vinaline and more resistant to abrasion and scuffing, has been developed for the protection of concrete and wood floors where walking but no trucking takes place.

High-Melting Resin NP 482

A new resin, Durez 240, manufactured by Durez Plastics & Chemicals, Inc., is very high-melting, bodies soft oils rapidly and makes varnishes that dry to a rich, full gloss with good flexibility.

Properties:

M. P. (Capillary method)	160°-170°C.
Acid No. (Ball and ring method, 315°-333°F.)	45-55
Color (Barrett scale)	C-3 to C-5

The resin is soluble enough in drying oils to be used as a chill-back; it is involatile enough so that there is practically no resin loss at any varnish processing temperature.

Increasing hardness and speed of set and decreasing water susceptibility, Durez 240 is capable of entering into reactions in the preparation of alkyd resins. In printing-ink vehicles it improves the drying characteristics of linseed oil substitutes.

Blended with candelilla or carnauba waxes, 240 produces excellent wax bases for "self polishing" or "no rub" emulsion waxes.

Corrosion Preventives NP 483

The Tretolite Company has developed a new class of reagents for the prevention of corrosion of oil and gas well equipment. Designated as Kontol corrosion preventives, these inhibitors have been shown by laboratory and field testing to be effective in materially reducing corrosion in either pumping or condensate wells.

Kontol 115 is a non-toxic, oil-soluble, nearly odorless liquid which readily lends itself to well treatment. There is no

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A SYNTHETIC ORGANIC DETERGENT THAT IS EFFECTIVE EVEN IN DILUTIONS OF 1 to 10,000

Of special interest to manufacturers of dyeing assistants, tanning specialties, laundry detergents, and general cleaners.

SULFRAMIN DT and SULFRAMIN LW (Powder) Powerful synthetic detergents and foaming agents unsurpassed wherever hard water presents a problem. LW has a higher lauric content, and consequently is preferred when used in water colder than 50° C. Textile processors, manufacturers of dyeing assistants, tanning specialties, bath preparations and laundry detergents use either type, depending upon the temperature of the solution. LW is recommended for automotive cleansers since cold water is commonly used for car washing.

SULFRAMIN DH (Paste) A concentrated, slightly alkaline detergent offering great money value as an all around boil off compound. It is adaptable to the manufacture of various scouring, cleansing and dyeing assistants; and is usable under any water conditions.

SULFRAMIN DT (Paste) A strictly neutral, synthetic detergent, with good wetting qualities and high resistance to hard water. Manufacturers of dyeing assistants, and textile processors, use it principally in scouring and dyeing preparations compounded to function wherever alkaline solutions are to be avoided.

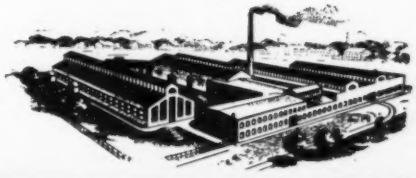
SULFRAMIN DR A neutral compound of high wetting and scouring qualities, having the appearance of a clear, sulphonated oil. It is immediately soluble in hot or cold water, and is therefore an ideal dyeing assistant. It can be employed advantageously as a straight product or in conjunction with various sulphonated oils. It lends itself ideally to the compounding of shampoos, liquid soap, and liquid cleansers.

SULFRAMIN P A powerful built-up detergent which is invaluable in the preparation of household detergents and cleaners. It is particularly efficient in washing machines, packaged laundry detergents, and general cleaners.

SULFRAMIN DHL A clear, leveling agent having the appearance of a sulphonated oil; and suitable for solving your most vexing dyeing problems. It has powerful leveling and penetrating qualities, and assures complete satisfaction in the processing of rayon and acetate fabrics. DHL also lends itself ideally to compounding; and is used extensively in the tanning industries for wetting-back applications.

SULFRAMIN N This is a non-foaming wetting agent, having the appearance of a heavy paste. Although of radically different chemical structure, Sulframin N shares many of the advantages inherent in many of the other Sulframin products. Its strongest feature is its complete immunity to the effects of inorganic acids and alkalies. Consequently, it is preferred in the processing of wool, such as in carbonizing, in dyeing, etc. Not only is Sulframin N an outstanding leveling agent; it can also be safely employed with any amount of alkali.

ULTRAPONE A liquid emulsifying agent, especially useful in water-in-oil emulsions, that is readily dispersible in water, and soluble in all organic compounds; such as hydrocarbons, alcohols, esters, etc. Formulated to lend greater cleaning power to naphtha solutions, Ultrapone is particularly valuable when used in dry-cleansing detergents; adhesive emulsions; and in the manufacture of many cosmetics.



ULTRA CHEMICAL WORKS, Inc.

• PATERSON, N. J. • IN CANADA . . . Delta Chemical Company, Brantford, Ontario

• CHICAGO, ILL. • IN MEXICO . . . Icon, S. A., Mexico, D. F.

tendency toward plugging of either the formation or well tubing by its use, since Kontol 115 does not show any reaction with salts carried by the brine, nor does it raise the pH of the brine with the possible resultant deposition of calcium or magnesium scales. Although oil-soluble, Kontol 115 is surface-active and builds up a thin film on the metal surface which protects the metal from corrosive elements in either brine or condensate. Since it is a concentrated inhibitor, only small volumes of Kontol 115 are required to maintain this film.

Heat-Proof Paint NP 484

Protection against corrosion and scale at high temperatures is the prime advantage of the new Markal heat-proof paint. It is said to prevent hot metals from corroding and scaling at temperatures as high as 1850° F. and provides protection to metals in all weather conditions.

The hot metal can be subjected to sudden temperature changes, such as quenching immediately in cold water, without cracking or peeling of the paint.

It is recommended for smoke stacks, annealing boxes, exhaust manifolds, furnace pipes, mufflers on trucks and tractors, etc. The paint is applied while the parts are cold. It dries in about 20 minutes and can be subjected to red-hot temperatures immediately after drying.

Bromo Analog Of DDT

The Colorado Agricultural Experiment Station, at Fort Collins, has been experimenting with 2,2-bis(*p*-bromophenyl)-1, 1,1-trichloroethane, an analog of DDT which the Station calls Colorado 9.

Like DDT, it is stable, not unpleasant in odor, and lethal to many insects. Among the insects controlled are flies, potato and tomato psyllids, tuber flea beetles, leaf hoppers and elm scale.

DDT, when used on leguminous plants at high concentrations, has a definite depressing effect on the bacterial nodules. In agricultural crop rotation, where legumes are grown to increase soil nitrogen, DDT is therefore at a serious disadvantage. It is most significant that Colorado 9 has no such depressing effect, permitting its use on legumes without disturbing the nitrogen-fixing mechanism.

Interesting Patents

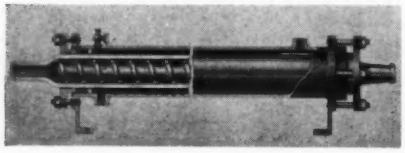
FORMALDEHYDE CYANHYDRIN synthesis comprises co-oxidation of ammonia and methanol in presence of ferric molybdate catalyst. No. 2,405,963. Alfred E. Larsen to E. I. du Pont de Nemours & Co.

TOLUENE produced from hydrocarbon product obtained by hydrogenation of carbon monoxide. No. 2,405,660. Norman Linn to Standard Oil Development Co.

NEW EQUIPMENT

Heat Exchanger QB 195

This new heat exchanger of the Duriron Co. is especially serviceable for heating or cooling small quantities of corrosive solutions over a wide temperature



range. The No. 4 size, first of this new line, handles an acid flow of from 4 to 14 g.p.m., with a heating capacity up to 155,000 BTU per hour with 75 lbs. steam and inlet temperature of liquid between 70°F. and 130° F., and a cooling capacity up to 90,000 BTU per hour, based upon 100° F. mean temperature differential. Larger sized units are being developed.

Features of the new heat exchanger include: (1) Separation of steam or coolant from the corrosive by a Duriron tube, (2) Vertical or horizontal installation, (3) No packing against corrosive solution, (4) Removal of parts without disturbing steam or coolant inlet and outlet connections.

Tilting Pump Base QB 196

The new Tilting Pump Base of Eco Engr. Co. is especially suitable where it is necessary to engage and disengage the pump.

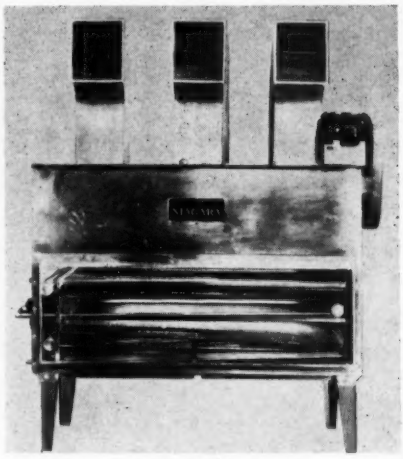
The new pump base is all bronze throughout, and incorporates a double-sealed, grease-packed outboard shaft bearing which retains its lubricant indefinitely, and assures reduced wear on the moving parts of the pump.

An excellent and convenient method of tightening a slack belt is also provided by the new base, which will hold the pump at any angle up to 45° by means of a wing nut. It will fit all ½" and 1" single and double impeller Eco gearless pumps.

Fan Heater QB 197

The high pressure system fan heater of the Niagara Blower Co. uses a dual coil system. This coil system is installed in a fan heater of standard design in which air is drawn through the heater by centrifugal fans.

The high pressure steam is condensed in the first finned coil, the condensate



flowing into a trap from which it is admitted to the regenerative vapor coil entering header where it flashes into vapor. Any of the high pressure condensate remaining liquid at this point is drained directly to the final condensate return header by a hairpin bend tube from which this condensate gives off its heat into the air stream.

The vapor condensing coil has its top (or vapor) leg finned and steeply pitched. The lower (or condensate return) leg is relatively flat, leading to the condensate return header in which there is a weir that keeps the liquid level high in this leg where it is in contact with the coldest portion of the air stream. This sub-cools the condensate below its relative return temperature. The weir has a bleed hole for draining the condensate upon shutdown.

From the vapor coil condensate return header the condensate is withdrawn into the return system to the boiler. Vacuum return is vaporfree and fully efficient, returning the condensate evenly and without flashing, at low pressure and temperature.

Screw Conveyor QB 198

The new Murco screw conveyors of the D. J. Murray Mfg. Co. are of continuous one-piece welded construction. There are no laps or rivets and the elimination of joints makes each section of the conveyor stronger. They are made of stainless steel or other metals according to customers' specifications.

Conveyor Belt Cleat QB 199

Rapids-Standard has developed a new curved cleat that reportedly cannot be pulled loose regardless of the condition of the conveyor belt.

The new cleat is formed from 12-gauge steel, and is securely fastened to

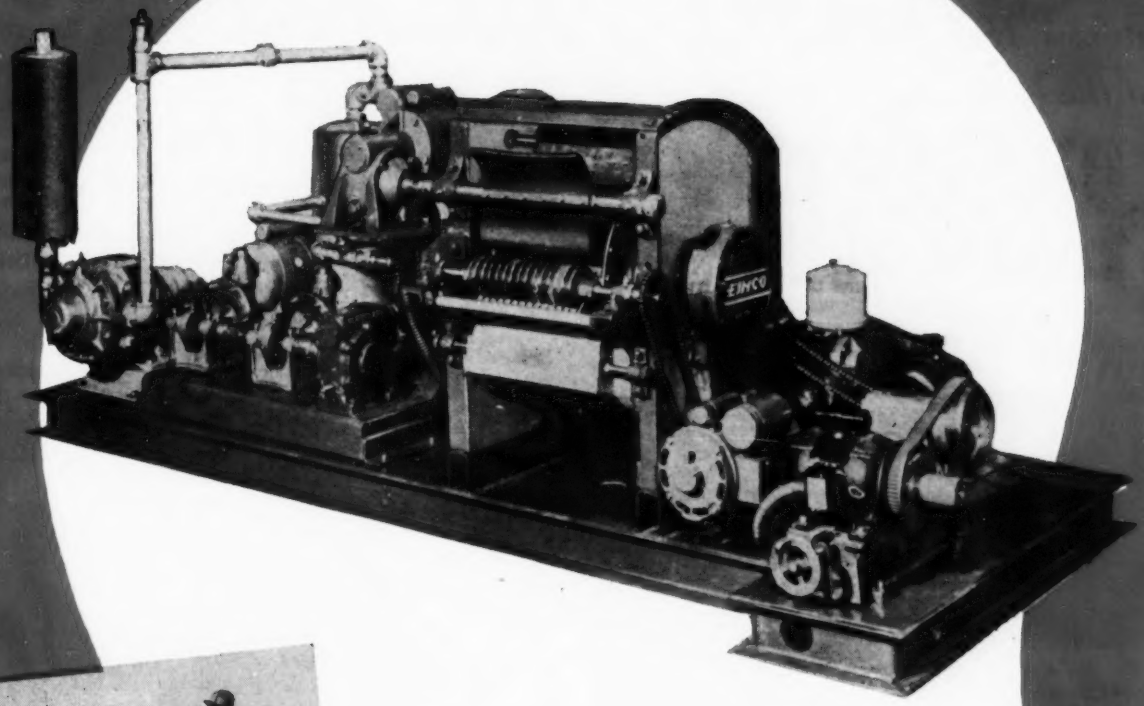
the conveyor belt with round-head bolts, hug-lock nuts and a 13-gauge steel reinforcing strip.

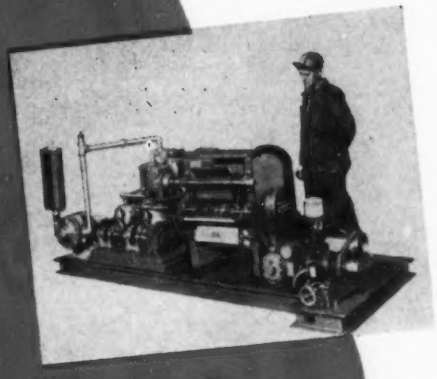
Fastening of the cleat entails drawing a small area of the belt within the concave side of the bottom leg of the cleat. This frees the reinforcing strip from contact with the conveyor bed and provides a vise-like grip that keeps the cleat solidly fastened.

Roller Ramp QB 200

The Yale & Towne Mfg. Co. has developed a new variation of the heavy-duty power truck, designed for the easier manipulation of massive machinery and crates into carrying position by means of an integral roller-ramp and cable-draw system. The new device is called the

EIMCO LABORATORY FILTERS





Eimco Laboratory Filter Units duplicate in every detail of construction full size Eimco Drum or Disc continuous vacuum filters. Results in the laboratory are dependable for use in the plant.

An added feature—sectionalized drums or discs—makes it possible to test a variety of filter media at the same time and quickly determine the type best suited for the job in hand.

Our new bulletin on Laboratory Filter Units describes their many advantages—write for it!

An Eimco engineer will be glad to call on you to discuss your filtration problems.

Continuous Vacuum Filters for Metallurgical, Food, Chemical, Starch, Beet Sugar, Cane Sugar, Cement and Flue Dust processes, Coal Dewatering, Salt and Sand Drying and Sewage Sludge Dewatering. Filters made to process the customer's product.

EIMCO

THE EIMCO CORPORATION

Executive Offices and Factories — Salt Lake City 8, Utah: Branches — 67 Wall St., New York 5 — 111 W. Washington St., Chicago 2 — Mills Bldg., El Paso — 1217 - 7th St., Sacramento 14

B 135

gravity tilting platform type of electric truck.

In operation the roller platform falls into ramp position when unlatched by the operator, and winch-drawn cables encircle the load to pull it onto the ramp and cause the ramp to rock back into the horizontal transporting position. Three pulling levels for the cable lines may be used, the lowest being direct from the cable drum (for very dense and low loads such as steel plate). The higher idler sheaves are employed to obtain higher purchases on such loads as machinery and bulky crates.

When empty, the roller platform is so balanced that virtually no effort is required to rock it into the horizontal position for empty return trips.

When running loaded, it is recommended that the pulling cables be left in position to hold the load engaged and prevent it from vibrating.

Neoprene-Coated Work Glove QB 201

A neoprene-coated work glove which is oil-proof and water-proof has been put

into large-scale production by the Riegel Textile Corp. The new gloves have a knit wrist and are lined with soft flannel for increased working comfort.

Pressure Filter QB 202

The new "Pur-O-Cel" water filter of %Proportioneers, Inc.% utilizes thin mats of diatomaceous earth rather than a sand bed, with greatly improved filtering results. It produces clear, brilliant water—removes all amoebic dysentery cysts and many bacteria. Other models will filter many fluids—oils, juices, wines, chemical serums, cleaning fluids, liquid soaps, etc. Due to its compactness and rapid filtration rate, the "Pur-O-Cel" Filter is much smaller than a sand filter of the same capacity and thereby saves floor space and reduces building costs. Backwashing of the filter for cleaning is easily accomplished without dissembling the unit and with a comparatively small volume of water.

Controller QB 203

Electronic principles of continuous control, according to Brown Instrument Co., have been developed for the first time in

PATTERSON-KELLEY
Heat Exchangers
AND
Process Equipment

PATTERSON - KELLEY
KETTLES

... engineered according to sound "heat-transfer" principles

These two words—"heat transfer"—are emphasized because the successful operation of a processing kettle depends largely upon the skill with which the necessary "transfer of heat" is designed into the unit. It should always be remembered that fundamentally a jacketed or heated kettle is a heat-transfer unit and is operated as such.

Two factors bearing on the problem of proper heat transfer are: selection and design of jacket, coil or electric element; type and size of mixer or agitator because in addition to doing the mixing, its job is to bring all the material being processed into contact with the heating or cooling surfaces within a limited time.

As "heat-transfer" specialists, we have designed and constructed hundreds of kettles involving many types for companies in the chemical, food and pharmaceutical fields. Our shopmen are skilled in fabrication with all metals, ferrous and non-ferrous. What we are doing in the way of kettle design and construction is discussed in more detail in Bulletin 103-K. In writing for a copy, tell us about your kettle requirements.

EST. 1880

THE PATTERSON-KELLEY Company, Inc.

112 WARREN STREET, EAST STROUDSBURG, PA.

NEW YORK 17—101 Park Avenue
CHICAGO 4—Railway Exchange Bldg.
PHILADELPHIA 3—1700 Walnut Street
BOSTON 16—96-A Huntington Avenue

Representatives in Principal Cities

the industrial thermometer and pressure gauge field. The instrument will be known as the Electr-O-Vane. It is applicable, it is reported, in processes which demand accurate control of temperature ranging from 100 degrees below zero to 1,000 degrees above.

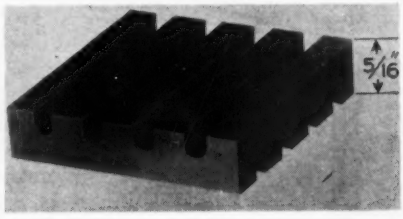
The Electr-O-Vane control unit operates on the principle that when a metal vane is interposed between two oscillator coils, the state of oscillation can be made to change or stop in an electronic circuit. This change or stopping oscillation causes the electronic circuit to operate a load relay.

Resistance Thermometer Bulb QB 204

The range of the resistance thermometer recorders and controllers of the Leeds & Northrup Co. has been extended to 1000° F. by their new bulb. It comes in 6" and 12" lengths and the temperature coil is held in a stainless steel coil. Installation and connection are facilitated by the standard universal head.

Rubber Pad QB 205

The new Isomode utility pad for use under all types of machinery as mounting pads and vibration absorbers of The MB



Manufacturing Co. is made of oil-resistant Neoprene. Standard pads are 18" square, 5/16" thick, and can be easily cut to any size or shape desired.

Smoke Detector QB 206

The new industrial smoke detector of the C-O-Two Fire Equipment Co is designed to detect fire with an enclosed light beam. It is the first to be fully approved by the Underwriters' Laboratories and operates on the principle of light reflected by smoke particles on to a photo-electric cell.

Air samples are continuously drawn into a detecting chamber where, at the first sign of smoke, a red smoke indicating lamp is lighted and an alarm sounds. A supervisory lamp and audible alarm provide continuous supervision of the detector.

Metal Cement QB 207

Metalon, the new product of Metalon Mfg. Corp., hardens thoroughly in less than 30 minutes and is easy to use. It is composed of a combination of metals in powder form together with a specially

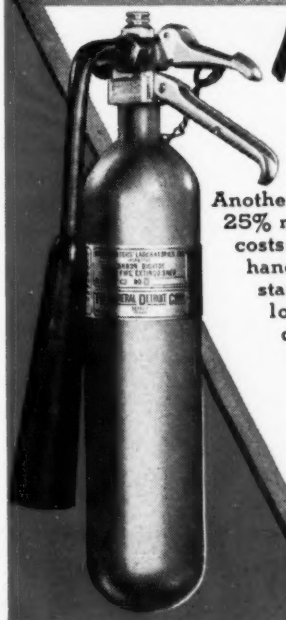
5 for 4

A New Addition to GENERAL'S Line of CO2-SnoFog Carbon Dioxide Extinguishers

GENERAL'S new 5-lb. CO2-SnoFog carbon dioxide extinguisher costs no more than the 4-lb. size—yet gives you 25% more fire protection. This makes GENERAL CO2-SnoFog the best buy in the fire extinguisher market—best for protection; best for economy.

The new 5-lb. GENERAL CO2-SnoFog fits the standard 4-lb. wall bracket. Improved design of the shell makes it unusually light and easy to handle, with no sacrifice of structural strength.

IF IT'S GENERAL IT'S DEPENDABLE



New 2½-lb. Size, Also!

Another new CO2-SnoFog—2½-lb. size—gives 25% more fire protection than the 2-lb. size, yet costs the same. It is light, strong, and easy to handle, due to improved shell design—an outstanding value. See the yellow section of your local telephone directory for your nearest GENERAL dealer. Ask him to show you both these new CO2-SnoFog extinguishers, or write for complete details.

Service For You . . .

Through GENERAL'S Distribution System

To assure you immediate service, GENERAL maintains a nation-wide network of 20 branch offices and warehouses. There is one near you. Call your local GENERAL representative for advice and counsel on all your fire protection needs, or write direct.

THE GENERAL DETROIT CORP.

Manufacturers of Fire Extinguishers
Motor Fire Apparatus and Allied Equipment

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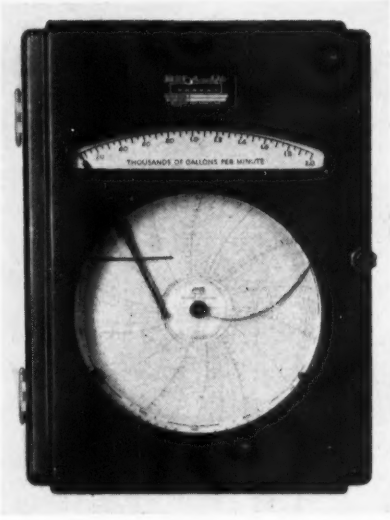
prepared liquid. The powder and liquid, when mixed, form a smooth paste that is easily applied to the crack or leak, without the use of fire or heat. In a few minutes it is as hard as the metal itself and expands or contracts under different temperatures, the same as the metal to which it is applied.

Metalon is steam, heat, pressure and waterproof and is equally effective on all metals. It resists gasoline, oil, and most chemicals.

Flowmeter Indicator-Recorder QB 208

An electrically operated secondary instrument for use with mechanical flow meters, or as a recording-indicating-totalizing tachometer, is a new product of



Builders-Providence, Inc. The instrument is actuated by impulses over a two-wire circuit from a transmitter which is mechanically driven by the primary meter. No power supply is necessary for the primary instrument. The transmitter consists of a switch which makes a contact for a predetermined number of gallons as they pass through the meter. The new instrument provides readings of total flow, rate of flow and a chart record of flow over any distance from a few feet to many miles from the primary instrument.

High Lift Hand Truck QB 209

The new high-lift platform model worksaver of the Yale and Towne Mfg. Co. fills a need for equipment mid-way between the simple hand truck and the complete heavy duty high-lift platform truck.

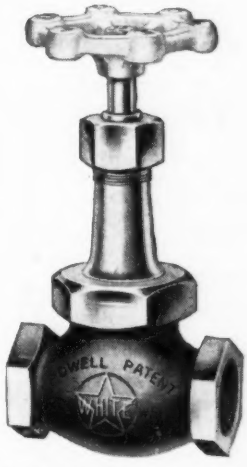
Two models are available: one with a platform which can get under a 7" skid and hoist it to a height of 66½"; the other with a platform which can get under a 11" skid and lift it to a height of 70½". Both models have a lifting capacity of 4,000 lbs. The 11" model has 10" diameter wheels under the load as

For assured flow control, the valve must suit the service

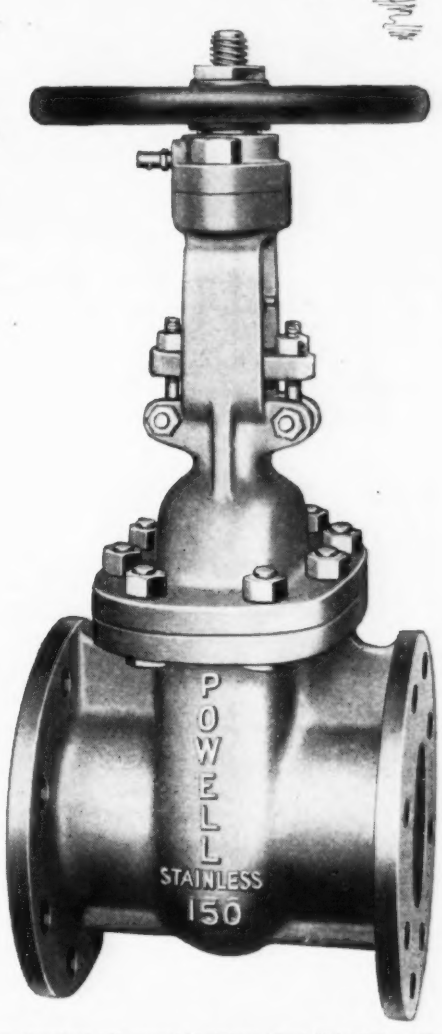
You don't have to be an Isaac Walton to know what's wrong with these fishing pictures. Silly misapplications of equipment, aren't they? But no sillier than using *valves* in services for which they were not specifically designed.

Through more than a hundred years of making valves—and valves only—Powell Engineers have been designing the *right* valves to suit the specific requirements of every existing industrial flow control service. Today, the Powell Line includes Bronze, Iron and Steel Valves of every necessary type, design, size and pressure. And, for corrosion resistance, Powell makes a notably complete line in the widest range of pure metals and special alloys ever used in making valves.

That's why, *for assured performance,* it pays to consult Powell.



Small size 200-pound Bronze Globe Valve for steam, oil, water or gas. For assured, long-life performance it has a renewable, specially heat treated stainless steel seat and a regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.



New, standard 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and taper wedge solid disc. This is one of Powell's many special designs for corrosion resistant valves which are available not only in stainless steels but also in many other alloys and pure metals.

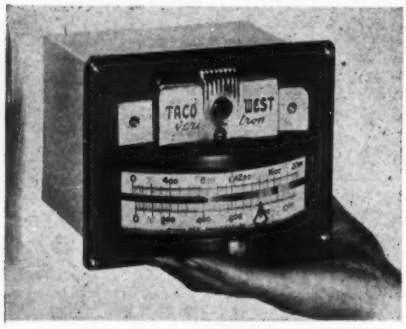
The Wm. Powell Co.
Cincinnati 22, Ohio
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

well as at the drive end, for working over rougher floor and yard surfaces. The units are so highly maneuverable that they can turn a right angle within 91", need only 54" aisles, and can swing within a circle of 95" radius. They can negotiate at 9% grade without "hanging up".

Pyrometric Controller QB 210

The new Veritron electronic pyrometric controller of the Taco West Corp. is a two position electronic controller.



In operation, the control pointer is set at the desired temperature and control is immediately established within a narrow temperature range. The design permits the instrument movement to operate a heavy duty relay system without any physical contact or reaction effect on the indicating pointer. The relay is built in and has a load capacity of 3 KW, non-inductive. The electronic circuit requires no adjustments by the user at any time. This is accomplished without using high frequency oscillator systems, capacitance systems or mechanical clamping mechanisms.

The electronic control mechanism is absolutely stable (chatter free relay operation) unaffected by line voltage variation, surge effects, tube ageing or component changes. A pointer movement upon scale of .002" produces exacting relay operation.

Measuring system and electronic mechanism are separately housed in sealed units that plug-in to the instrument case. The complete instrument measures only 7⅛" by 5¾" by 5¼", and may be either flush or surface mounted. A full five-inch mirrored combination scale is standard.

Recording Pyrometer QB 211

The new Dynalog electronic recording pyrometer of The Foxboro Co. has no galvanometer, slide wire or dry cell, and requires no standardizing. Continuous balancing action enables the pen to traverse the full width of the chart in one second. The sensitivity is 0.1% of the full scale range with ranges of -200° F. to 2800° F. for use with thermocouples or electric resistance bulbs. Recorders and recording controllers are offered.

In addition to temperature applications Dynalog instruments are also in use for measurement or control of humidity, strain, pH, speed and many other process variables.

Leak Detector QB 212

In the new detector for leaks in vacuum systems of the Davis Emergency Equipment Co., a heated wire, housed in a

metal chamber, is part of a Wheatstone bridge circuit. When a vacuum is pulled on the chamber, the filament becomes slightly chilled, upsetting the balance of the bridge and causing a needle to rise on the scale of the meter.

It is claimed that this instrument will register a leak as small as the equivalent

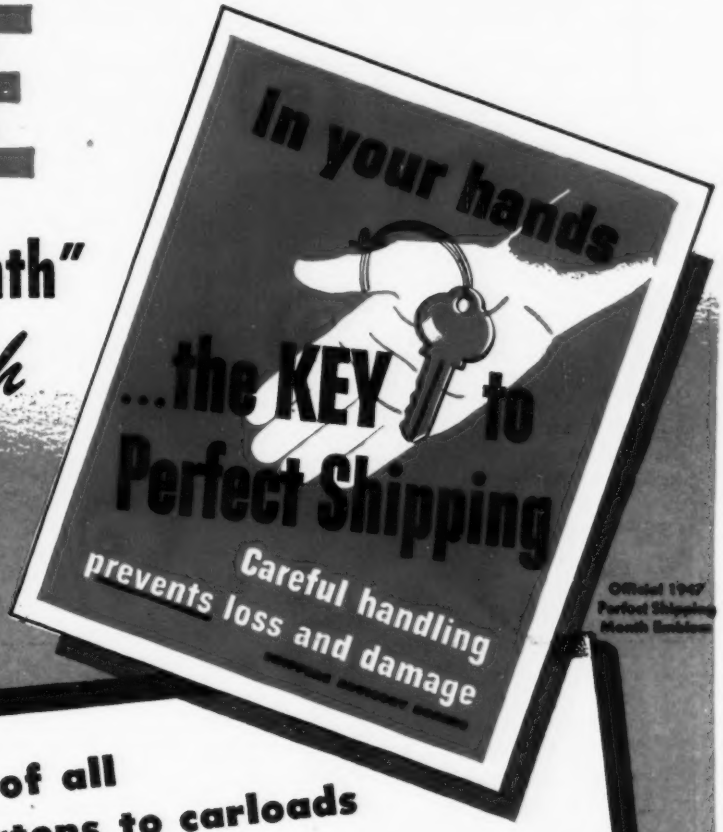
OBSERVE

"Perfect Shipping Month"

Every Month

with

SIGNODE STEEL STRAPPING



Observance of national *"Perfect Shipping Month"* emphasizes the wisdom of applying its basic principles all through the year—an objective to which Signode's PLANNED PROTECTION is specifically pointed. Signode applications lead to extra profits by cutting avoidable losses in transit. Other important savings are elimination of pilferage, lower transportation costs, fewer damage claims and a reduction in shipping room expense.

Signode engineers are ready to help you achieve these benefits. Call the Signode office nearest you or write direct to SIGNODE STEEL STRAPPING COMPANY, 2662 N. Western Ave., Chicago 47, Ill.; 395 Furman St., Brooklyn 2, N. Y.; 481 Bryant St., San Francisco 7, Calif. Branches in 21 Principal Cities.

THE STEEL STRAPPING METHOD

SIGNODE

Reg. U.S. Pat. Off.

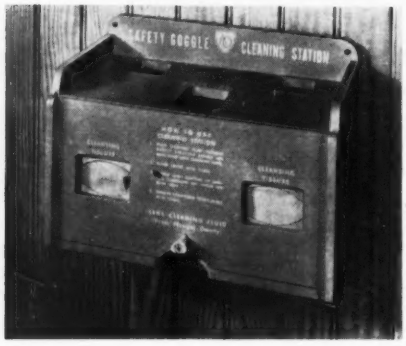
FOR ALL TYPES OF SHIPMENTS

of .006" water, which causes a ⅛" deflection of the needle on the scale. Further it can be used equally well in the detection of leaks when checking welded seams or joints on equipment under pressure.

The unit is furnished with a short tube having a rubber suction cup on the end to be applied at the point of detection. This tube is connected to the instrument and when the rubber suction cup covers a leak, the needle on the meter rises.

Goggle Cleaning Station QB 213

The new safety goggle cleaning station, of American Optical Co. which can be attached to the wall at strategic loca-



tions throughout plants, is a constant reminder for workers to keep goggles clean. It is 13" long, 9" high and 6" deep and directions for use are printed on the front panel of the cabinet. Supplies of the necessary lens cleaning fluid, cleansing tissues and anti-fog compound for reducing fogging, steaming and frosting of lens surfaces are also obtainable from the company.

Strap-On Thermostat QB 214

A new strap-on thermostat, designated the Type "S", is designed especially by United Electric Controls Co. for controlling temperatures within a differential of 15 degrees. The bi-metal thermal assembly is actuated by heat transferred by the rear of the thermostat housing. The Type "S" has a dial adjustment calibrated from 40° to 210°.

Voltage rating is 110 to 220 AC; wattage is 1200 resistance, 300 inductive. It is suitable for pilot duty operation. Three types of switch action are available: (1) normally closed, makes on falling temperature; (2) normally open, breaks on falling temperature; (3) double throw, one side normally closed, one side normally open, no neutral position.

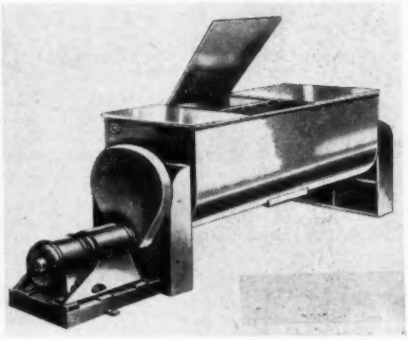
Rectifier QB 215

Selenium rectifiers produced through a new method of electrolytically depositing selenium have been developed by Ion Industries, Inc. They are cylindrical in shape with circulating liquid cooling for high amperage capacity.

Ion rectifiers are constructed in standard unit elements giving capacities from 250 amperes of the standard single element to that needed for large industrial applications.

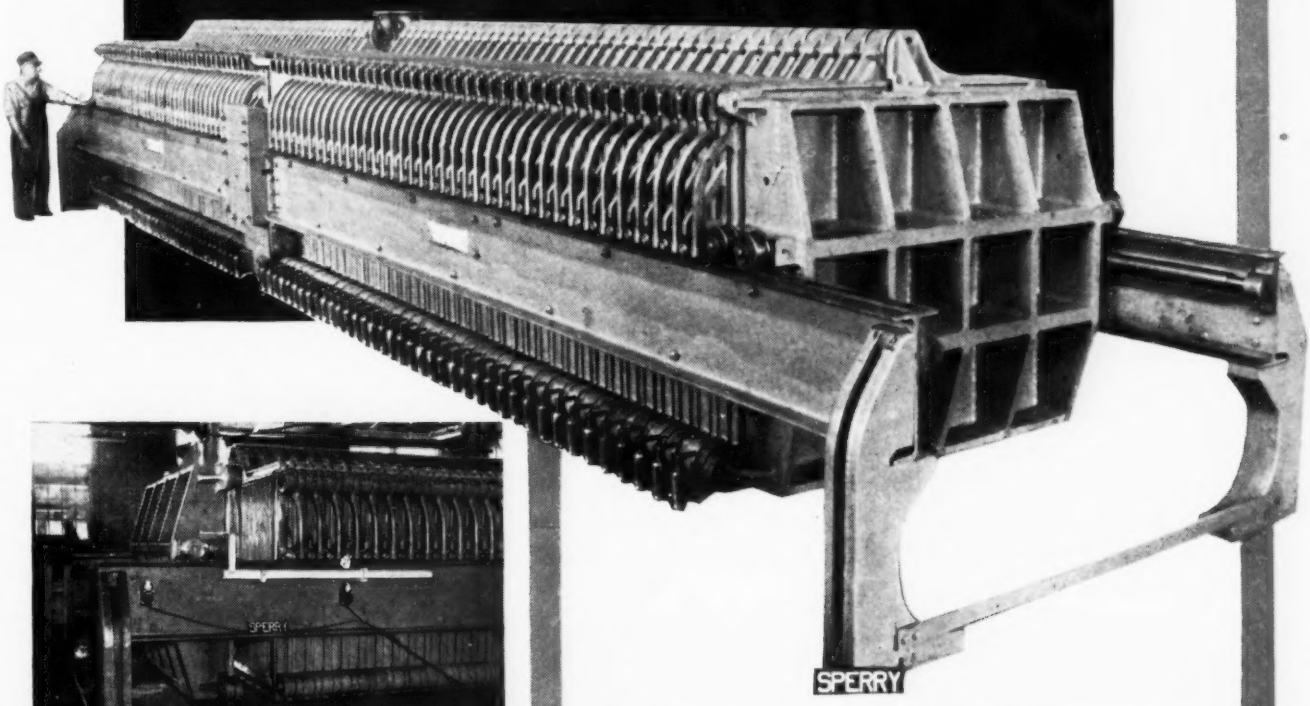
Horizontal Mixers QB 216

Several types of single and multiple arm horizontal mixers and blenders suitable for mixing and processing materials

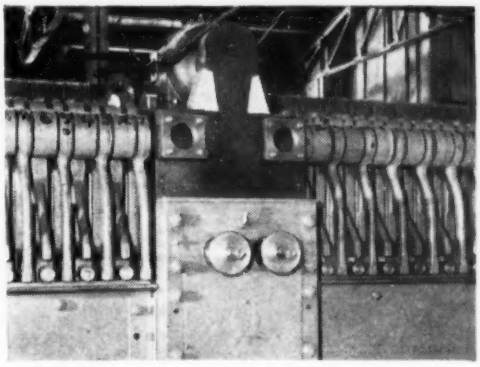


from dry powders to heavy viscous slurries and pastes have been introduced by The H. W. North Co. These improved machines are custom engineered for each individual application for batch, automatic or continuous operation. They are

80 TONS OF EFFICIENCY



Detail view of the electrical opening and closing limiting mechanism showing head in open position.



Center head clutching mechanism which permits closing ends separately or together.

● Eighty tons of efficiency for the manufacture of malt extract awaiting shipment at the Sperry plant, Batavia, Illinois. This Filter Press, one of the largest on record, measures 42 feet in length and stands eight feet high. Filter plates measure 61 by 71 inches.

It is typical of Sperry's ability to build *exactly* the right filter press for the job . . . from the smallest laboratory unit to the largest industrial installation.

The design and manufacture of every Sperry press is based on a thorough study of the problem . . . plus over a half-century of experience and research in all types of industry. Why not put a Sperry engineer to work on *your* filtration problem? There's no obligation.

D. R. SPERRY & COMPANY

BATAVIA, ILLINOIS

Filtration Engineers for Over 50 Years

SPERRY

FILTER PRESSES

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New York 17, N. Y.
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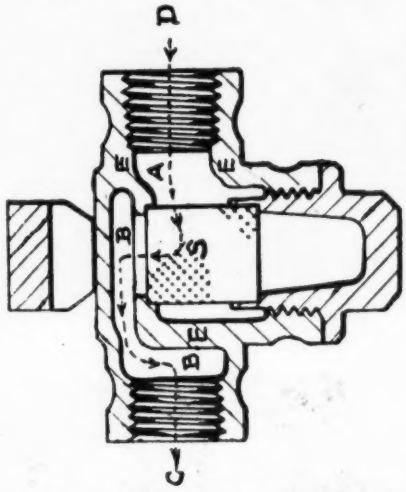
Western Sales Representative
B. M. Pilhashy
1033 Merchants Exchange Bldg.
San Francisco 4, Calif.
Phone Do 0375

available in plain or stainless steel construction with mixing chambers jacketed when required for heating or cooling. Special designs for processing materials under vacuum or internal pressure have also been developed to meet such service conditions.

Magnetic Screen Trap QB 217

The new magnetic screen trap of the Cooney Valve and Screen Co. incorporates a special mesh screen and an Eriez Alnico permanent magnet into a single unit.

The body of the trap is made of brass,



bronze or aluminum. The screen is without braces, stanchions or supports which offers a clear, unobstructed filtering area. It is a unit separable from the screw cap to facilitate cleaning, renewal or change of wire mesh. The combination of the screen trap with a powerful permanent magnet stops all abrasive material—both magnetic and non-magnetic.

Stainless Steel Electrodes QB 218

The new complete line of stainless steel electrodes of Air Reduction Sales Co. is furnished with a heavy extruded lime type coating for DC application. In addition all but the straight chrome analyses are obtainable with a lime-titania type coating which is usable on AC or DC.

This latter class of electrodes can be recommended for all applications on which the lime type of electrode is used, with the possible exception of highly restrained joints on heavy sections or on steels of high hardenability.

Hydraulic Pump QB 219

Superdraulic Corp. has extended their line of hydraulic pumps to include a pump delivering 5000 psi in continuous service. It is only 6" in diameter, 11" long, and weighs approximately 35 pounds. The single bank of plungers delivers three gallons per minute at 1,800 rpm, and two gallons per minute at 1,200 rpm.

Wherever you go — whatever you do
You use products made better with BECKMAN pH CONTROL!

Did You Know These Beckman pH Facts?

...that Beckman pioneered modern glass electrode pH equipment, transforming the cumbersome laboratory apparatus formerly used into a compact, practical, portable instrument that paved the way for today's simplified pH measurement and control?

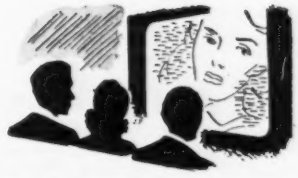
...that the first completely automatic glass electrode pH indicator, recorder and controller was pioneered by Beckman? Operating entirely without batteries, this instrument made automatic process control accurate, convenient, practical—and is today widely used in all parts of the world.

...that Beckman pioneered the High Temperature Glass Electrode system which, for the first time, enabled continuous pH measurements to be made at temperatures up to 212°F (100°C)? This electrode system is of tremendous value wherever hot process fluids must be controlled.

...that the High pH Glass Electrode system is also a Beckman development? This unique glass electrode unit can be used to measure high pH values *even in the presence of sodium ions*... and extends the usefulness and accuracy of glass electrode equipment to many industries where alkaline solutions in combination with sodium ions have heretofore presented difficulties.

...that the above are only a few of many developments that make Beckman pH Equipment the most advanced, the most accurate, the most adaptable in the field of pH?

The tires you ride on are made with the aid of Beckman pH Control. It was found that coagulation of the synthetic rubber is very sensitive to variations in the pH (acidity or alkalinity) of the processing solutions. Therefore, Beckman Automatic pH Equipment is used to control these processes for efficiency and economy.



The motion pictures you see are processed with the aid of Beckman pH Control. The developing laboratories of the major motion picture studios discovered that Beckman pH Equipment gives better control of the quality and uniformity of the film developing processes, insures clearer prints, less waste and better projection qualities.

The water you drink is probably Beckman pH Controlled. In more and more municipal water systems, purification of the drinking water is being regulated with the aid of Beckman pH Equipment, thus insuring a water supply that is both pure and uniform—plus important savings in treating costs.

The food you eat is another item that, today, is made better and more uniform with the aid of Beckman pH Control. It has been found that virtually all types of food processes—from baking crackers to canning meats—are performed more efficiently, more economically with the aid of Beckman pH Equipment.

Are YOU Using This Cost-Cutting Tool in Your Plant?

ONLY A FEW YEARS AGO pH control was more of a laboratory curiosity than a cost-cutting industrial tool. But today—largely through the far-reaching developments of the Beckman research staff—modern pH control has become an indispensable tool for speeding chemical processes, safeguarding quality, reducing waste and simplifying production operations throughout industry. *In fact, wherever there's water there's pH...and wherever water or water processes are used, chances are the job can be done quicker, better, at lower cost with Beckman pH Control.*

How About Your Product?

The above are but a few of the innumerable ways alert industries are cutting costs, improving product quality, reducing waste and making other vital savings with Beckman pHControl. Have you investigated the vital savings it can make in *your* operations? Our engineers will gladly study *your* pH problem and suggest ways that Beckman pH Control can save money for you. *Beckman Instruments, National Technical Laboratories, South Pasadena 17, California.*

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BECKMAN **INSTRUMENTS CONTROL MODERN INDUSTRIES**

PACKAGING & SHIPPING

by T. PAT CALLAHAN

I.C.C. Admits New Type Drum

Recent changes in the Interstate Commerce Commission regulations pertaining to shipping of chemicals are of far-reaching importance to the chemical industry. Among these amendments, quoted here in full, is the specification for a new single-trip removable-head steel drum.

T. Pat Callahan

IMPORTANT changes were made in the regulations for the transportation of explosives and other dangerous articles by the Interstate Commerce Commission on February 24, 1947. The following changes, amendments, and additions to the regulations were promulgated on this date.

Par. (b) (2), sec. 31 was amended by the addition of the following:

(b) (2) For repairs to forge-welded tanks of ICC-105A series, or fusion-welded tanks of ICC-W classes, or equipment therefor, requiring welding, the owner of the tank, or party authorized by the owner, must secure approval of such repairs from the Association of American Railroads' committee on tank cars. Fusion welds for repairs must be performed, inspected, and tested in the manner described by currently effective specification for the class of tank concerned, *or the specification under which the tank was originally constructed.* X-raying and stress relieving are required and must be done in an approved manner. Caulking of welded joints is prohibited. Tanks must be retested, as prescribed in section 31 (f), before being returned to service. For repairs to forge-welded tanks of ICC-105A series, or fusion-welded tanks of ICC-W classes involving hot or cold working of the shell to restore contours as near as practicable to original design and construction, the owner of the tank, or party authorized by the owner, must render a detailed report of such repairs to the Secretary; Mechanical Division, Association of American Railroads.

The purpose of this amendment is to permit renewal of anchor rivet cover caps of the direct attachment type to tank cars previously so equipped.

By the addition of a new type specification 17H metal drum (single-trip) which specification is included in this article, the following paragraphs and sections are amended to include the use of the new type specification 17H drum:

Par. (h) (3), sec. 62 (*Packing and weight fulminate of mercury, wet*).
Par. (m) (3), sec. 62 (*Packing and weight nitrosoguanidine, wet*).
Par. (b) (4), sec. 110 (*Inflammable liquid with flash point above 20° to 80° F.*)
Par. (d) (11), sec. 110 (*Viscous inflammable liquids*).
Par. (b), sec. 153 (*Inflammable solids and oxidizing materials*).
Par. (e), sec. 156 (*Packing barium peroxide*).
Par. (c), sec. 160 (*Packing calcium chlorite and sodium chlorite*).
Sec. 160A.
Par. (c), sec. 163 (*Packing chlorate of soda, chlorate of potash, and other chlorates*).
Par. (c), sec. 164 (*Packing chromic acid*).
Par. (c), sec. 166 (*Packing cobalt resinate, precipitated, calcium resinate, and calcium resinate fused*).
Par. (c), sec. 173 (*Packing inflammable solids and oxidizing materials, etc.*).
Par. (d), sec. 175 (*Packing lacquer base, or lacquer chips, dry*).
Par. (f), sec. 184 (*Packing nitrocellulose or collodion cotton, wet, etc.*).
Par. (d), sec. 187 (*Packing peroxide of sodium*).
Par. (d), sec. 188 (*Packing phosphoric anhydride*).
Par. (d), sec. 204 (*Packing sodium hydrosulfite*).
Par. (a) (1), sec. 206 (*Packing sodium or potassium, metallic, etc.*).
Par. (a) (4), sec. 206 (*Packing sodium of potassium, metallic, etc.*).
Par. (b) (4), sec. 207 (*Packing sulfide of sodium or sulfide of potassium, fused or concentrated, when ground*).
Par. (c), sec. 213A (*Packing zinc ammonium nitrite*).
Par. (f), sec. 356 (*Packing carbolic acid (phenol), not liquid*).
Par. (c) (1), sec. 361 (*Packing poisonous solids, as defined in sec. 350, etc.*).

Paragraph (b), sec. 242 (*Packing bottles containing acid or other corrosive liquids etc.*) is amended to read as follows:

(b) When bottles containing acid or other corrosive liquids are cushioned by incombustible absorbent material and securely packed in tightly closed metal containers, except hydrofluoric acid which must be packed in a container other than a metal container, they may be packed with other articles. This exception does not apply to nitric or perchloric acids, or *hydrogen peroxide exceeding 52 percent strength by weight,* which must not be packed in the same outside container with any other article under any circumstances.

The purpose of this amendment is to prohibit the shipment of hydrogen peroxide exceeding 52 per cent strength by weight in the same outside container with any other article under any circumstances.

Paragraph (u), sec. 245, has been amended by adding the following:

(u) Hydrogen peroxide over 52 percent strength by weight.

The purpose of this amendment is to include in the regulations an additional commodity which is not exempt from any of the provisions of the regulations.

Section 247, par. (d) was amended by the addition of specification ICC 1D.

Section 248, par. (b) has been amended

Specification 17H

Steel Drums, Single-Trip Container (Removable head)

Marked Capacity not over (Gallons)	*Type of Container*	*Minimum Thickness in the Black (Gage U. S. Standard)*			*Rolling Hoops*		
		Body Sheet	*Bottom Head Sheet*	*Removable Head Sheet*	*Type*	*Minimum Size (Gage or inch)*	*Minimum Weight (pounds per foot)*
5	St. Side	24	24	20	none	.....	.....
30	do	18	18	18	(1)	.....	.....
55	do	18	18	14*	(2)	.....	.....

(1) Rolled or swedged in hoops.
(2) Each drum must have three rolled or swedged in hoops, one to be placed in the body near the top curl.
* 16-gage authorized provided there are one or more additional hoops in the body near top curl, and provided there are one or more corrugations in the cover near the periphery.

Containers must comply with specification 5A except as follows (paragraph references are to specification 5A):

5. (b) and (c) and 6. These paragraphs do not apply.

7. Parts and dimensions.—As follows:
[Editor's note: See table above.]

8. Convex heads. — Convex (crowned) heads, not extending beyond level of chime, required for drums of 25 gallons capacity or over; minimum convexity of 3/8 inch required.

9. (a) Closures. — Adequate to prevent leakage; gaskets required.

9. (b) Drums over 5 gallons capacity must be closed by means of 12 gage bolted ring with drop forged lugs, one of which is threaded, and having 5/8 inch bolt and nut. 5 gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives.

9. (c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16 inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Provided, that for containers having a capacity of 12 gallons and less the seat (flange, etc.) for plug, or cap, must have two or more complete threads and plug, or cap, must have sufficient length of thread to engage two threads when screwed home with gasket in place.

9. (d) and (e).—These paragraphs do not apply.

11. (a) ICC-17H. — This mark shall be understood to certify that the container complies with all specification requirements. The letters STC; located just below or above the ICC mark to indicate "single trip container."

13. (a) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

13. (b) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

14. Leakage test.—Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch for containers over 12 gallons capacity and at least 5 pounds for others. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

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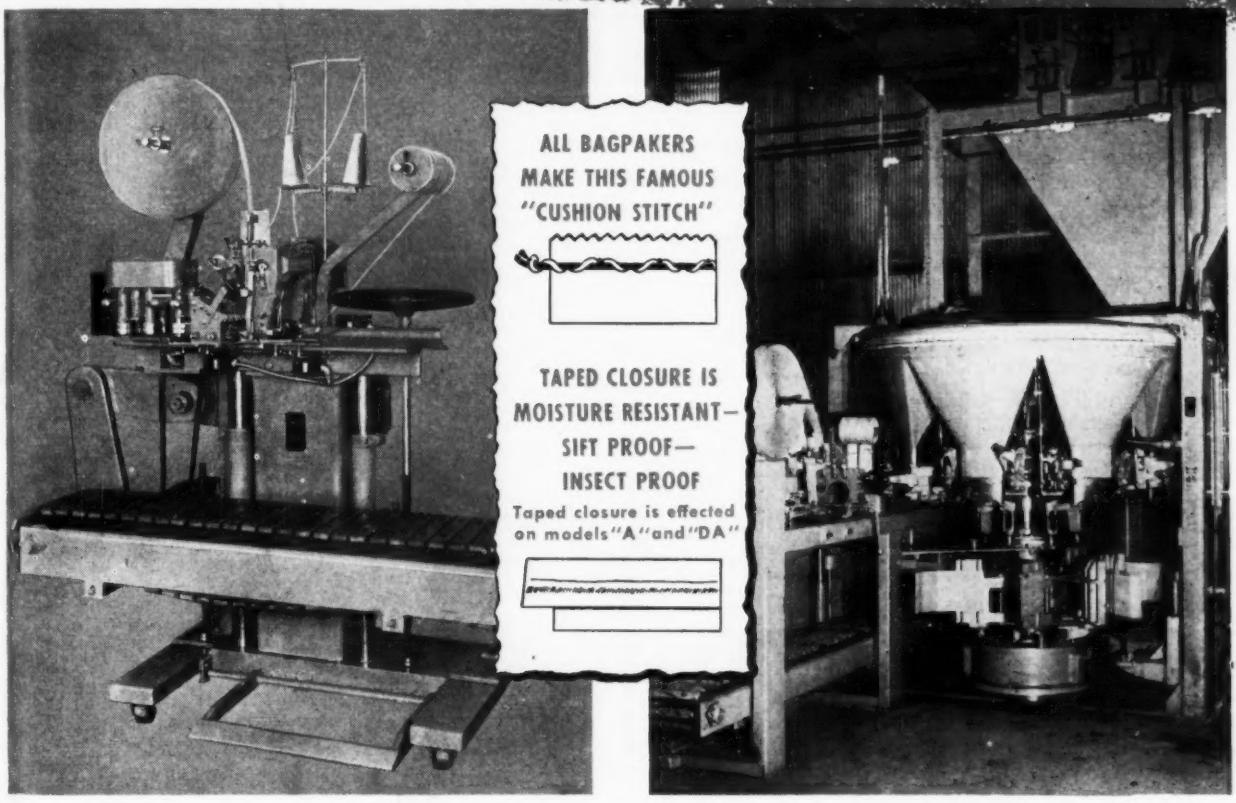

MODEL "D A" (portable)—One operator, filling and closing, can handle 2 to 4 100-lb. bags a minute . . . 6 to 12 a minute where filled bags are delivered to BAGPAKER conveyor (quickly adjustable for various bag sizes). Starting and stopping of sewing operation is automatic, no tape wasted.

MODEL "A"— Completely automatic — extremely accurate weighing. Saves on "give away" material, labor and bag costs, thus paying for itself quickly. Machine capable of filling and closing 100-lb. bags at the rate of 15 per minute . . . needs one operator.

At absolutely no obligation to you, a BAGPAK engineer will gladly discuss your packaging machinery and multiwall paper bag requirements . . . show you the best methods of weighing, closing and handling bags.

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INTERNATIONAL PAPER PRODUCTS DIVISION,
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220 EAST 42nd STREET, NEW YORK 17

by the addition of ICC specification 1D.

Section 249, par. (d) (1), has been amended by the following addition:

(d) (1) Spec. 17E, or *17H.*—Metal drums (single-trip). Authorized only for liquid boiler compounds or liquid water treatment compounds.

Paragraph (c), Section 254A, has been amended by the addition of ICC specification 17H—metal drums (single-trip) not over 5 gallons capacity. This refers to the packing of chromic acid solution.

Section 255 has been amended by the addition of ICC specification 103A—tank cars, for the shipment of dimethyl sulfate.

Par. (c), sec. 260A, has been amended by the addition of the following:

(c) Spec. 1A.—Boxed carboys. *Glass bottles having nominal capacity of 3 gallons also authorized when packed and tested in accordance with requirements of Spec. 1A; necks must be protected during shipment.*

This refers to the packing of ethyl chloroformate and methyl chloroformate.

Par. (b), sec. 262, has been amended to include ICC specification 1D, boxed carboys. This refers to hydrobromic acid.

Par. (c) (2), sec. 265, has been amended by the addition of ICC specification 1D, boxed carboys. This refers to the packing of hydrofluosilicic acid.

The entire section 266 has been cancelled under the amendment and the following section has been substituted. This paragraph refers to the packing of hydrogen peroxide, etc., and is quoted in full as follows:

266 (a) (1) Hydrogen peroxide containing over 52 percent H_2O_2 strength by weight must be packed in specification containers as follows:

(a) (2) Spec. 15A, 15B, 15C, 16A, or 19A.—Wooden boxes with inside containers consisting of glass bottles not over 1 quart capacity each; bottles must have vented closure and must be packed in a metal container vented at bottom packed in another metal container vented at top; cushioning material shall be used between glass bottle and inner container and between inner and outer metal containers; cushioning material shall be vermiculite or equivalent in an amount at least 10 times the volume of the hydrogen peroxide shipped and shall be wet with at least .0 percent water by volume to which has been added a stabilizing agent.

(a) (3) Spec. 42D.—Aluminum drums with vented closure in top head; not over 30 gallons capacity; side openings not permitted. Closure must be sealed to prevent removal in transit and top head plainly marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE". For shipments other than carload or truckload lots loaded by consignor and unloaded by consignee drums must be of design and venting arrangement approved by the Bureau of Explosives.

(b) (1) Hydrogen peroxide containing not over 52 percent H_2O_2 strength by weight may also be packed in specification containers as follows:

(b) (2) Spec. 15A, 15B, 15C, 16A, or 19A.—Wooden boxes with glass or earthenware inside containers of not more than 1 gallon capacity each. Inside containers must be well cushioned. All material used for cushioning must be incombustible mineral matter, such as whiting, mineral wool, infusorial earth, asbestos, or sifted ashes. Cushioning of inside containers in outside wooden boxes by means of elastic packing, such as wooden strips or large corks fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys in spec. 1A.

(b) (3) Spec. 34B.—Aluminum carboys.

(b) (4) Spec. 42D.—Aluminum drums with vented closure in top head; not over 30 gallons capacity. Closure must be sealed to prevent removal in transit and top head plainly marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE." Aluminum drums already in service for the transportation of this material, manufactured prior to April 24, 1934, and of at least equal strength and efficiency thereto, may be continued in use until further order of the Commission.

(b) (5) Spec. 42E.—Aluminum drums (single-trip).

(c) (1) Hydrogen peroxide containing over 8 percent H_2O_2 strength by weight and not exceeding 37 percent may also be packed in specification containers as follows:

(c) (2) Spec. 1A.—Glass carboys. The cushioning must be incombustible mineral material, elastic wooden-strip packing, or large elastic cushions such as corks fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited. The carboy stoppers must be vented so as to prevent accumulation of internal pressure; use of cork gasket impregnated with paraffin is authorized.

(c) (3) Spec. 1X.—Boxed carboys of 5 to 6 gallon capacity; single-trip for export only. For shipment via common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(c) (4) Spec. 1D.—Boxed glass carboys of not over 6.5 gallons nominal capacity. Means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 130°F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge. The cushioning must be incombustible mineral material, elastic wood-strip packing, or large elastic cushions such as corks fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

(d) (1) Hydrogen peroxide containing over 8 percent H_2O_2 strength by weight and not exceeding 10 percent may also be packed in specification containers as follows:

(d) (2) Spec. 10A.—Wooden barrels, paraffin-lined.

(e) (1) Hydrogen peroxide not exceeding 52 percent H_2O_2 strength by weight not subject to these regulations when shipped in tank cars or tank motor vehicles.

(e) (2) Hydrogen peroxide exceeding 52 percent H_2O_2 strength by weight may also be shipped in tank cars or tank motor vehicles subject to these regulations provided that such shipments are for ultimate use by the War or Navy Departments of the United States Government. Tank cars and tank motor vehicles must be of design and venting arrangement approved by the Bureau of Explosives.

This substitution for the entire paragraph 266 is necessary to provide safe

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Happy Ending: He meets a strong, dependable, economical container — Bemis Waterproof Laminated Textile Bags. Now our rebellious powder behaves perfectly. He has overcome his only fault. Everybody likes him, and he gives much credit for his popularity to puncture-resistant, siftproof Bemis Waterproof Bags.

PRE-TESTS STOP PROTESTS! Bemis Waterproof Laminated Textile Bags head off complaints because they are tested *before* they are put to work. Their strength and tear-resistant, puncture-resistant qualities are pre-proved for you. And their economy is attested by thousands of users.

This Bemis Waterproof Bag is light in weight, yet is the strongest shipping bag made. It protects both ways — what's inside the bag and what's outside, too. It assures low-cost protection against sifting, breakage, change in moisture content, escape or absorption of odors, and many other common shipping complaints. A Bemis Waterproof Bag can be made acid-, oil-, or grease-resistant. It's ideal for LCL and export shipments. It saves on container costs and, empty or filled, it saves storage space and freight costs.

If the *exact* Waterproof Bag you need doesn't exist, the Bemis Shipping Research Laboratory will design it for you.

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containers and necessary regulations to cover the shipments of hydrogen peroxide in strengths not shipped commercially before. A great amount of time and effort, both by the industry and by the Commission, has gone into the preparation of the new section.

Sub-paragraph (a) (6) (b), sec. 267, has been amended as follows:

(a) (6) (b) Spec. 1D.—Boxed glass carboys of not over 6.5 gallons nominal capacity; authorized only for mixed nitric and sulfuric acid, containing not over 17 percent nitric acid and containing at least 33 percent water; means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 103°F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge. Cushioning must be incombustible mineral material, elastic wood-strip packing, or large elastic cushions such as cork, fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

Par. (c), sec. 269, has been amended to include ICC 1D, boxed carboys. This refers to the packing of perchloric acid, etc.

Par. (q) (1), table in sec. 303, par. (q) (1), note 16, sec. 303, and par (q) (1), note 7, sec. 303, all referring to compressed gases in tank cars and motor vehicles have been amended. These amendments pertain to argon, nitrosyl chloride, vinyl chloride, hydrogen, or nonliquefied hydrocarbon gases. Reference to these amendments should be made by all interested in the shipment of these materials.

Section 354 has been amended as follows:

(e) (1) Arsenical compounds n.o.s. containing not more than 6 percent arsenic of which not more than .25 percent is water soluble must be packed in specification containers as follows:
(e) (2) As prescribed in sec. 354 (b), (c), or (d).
(e) (3) Spec. 44B. — Paper bags with two added inside thicknesses of No. 1 Kraft paper, one sheet having a Mullen test of 50 and the other sheet having a Mullen test of 40. Net weight not over 50 pounds each.
(f) Multi-wall paper bags having combined strength of 360 pounds, Mullen or Cady test, or equivalent, are authorized, upon demonstration and proof of satisfactory tests to representative of the Bureau of Explosives. Bags so approved must be marked "ICC-44BX."

The following amendments to the Shipping Container Specifications are also included in this order of the Interstate Commerce Commission.

Par. 4, Specification 1A, has been amended as follows:

4. Capacity and marking of Carboy.—Containers 5 to 13 gallons are classed as carboys; *glass bottles having nominal capacity of 3 gallons also authorized when boxed in accordance with the requirements for carboys having 5 gallon capacity.* Must be permanently marked to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

Specification 3B, 3BN, 3C, 3D, 3E, 4, 4A, and 4C have been clarified by the addition of the following sentence:

23. Acceptance not authorized under par. 23.

Par. 2 of Specification 5A has been amended as follows:

2. Rated capacity as marked, see paragraph 11 (c). — Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, *except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon;* actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

Paragraph 9(b), Specification 5A, has been amended as follows:

(b) *Closing part (plug, cap, plate, etc.) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. *If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.*

* This does not apply to cap seal over a closure which complies with all requirements.

The leakage test for Specifications 5A, 5B, 5D, 5F, 5L, 6A, 6B, 6C, 17C, 17E, 17X, 42B, 42D have been amended by the addition of the following to each Specification:

Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representatives of Bureau of Explosives.

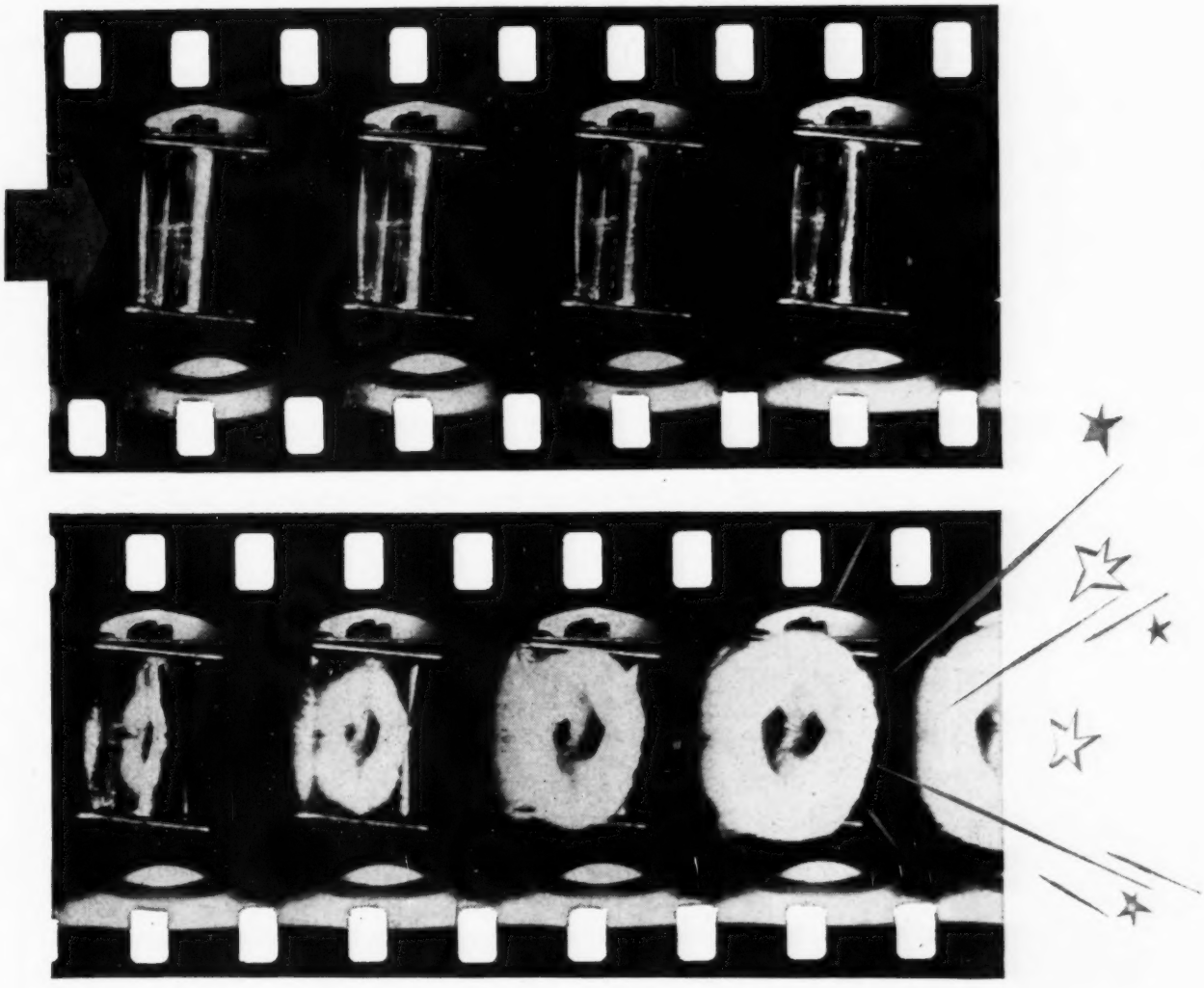
ICC Specification 15D, 16B, have been amended by inclusion of handles which may be applied to these containers at the discretion of the shipper.

ICC Specification 17E has been amended as follows:

(Cancel) Removal head containers which will pass all required tests are authorized.
(Add) Removable head containers not authorized.

Superseding and amending part of par. 7, Spec. 17E *(Parts and dimensions)*, order Aug. 16, 1940, to read as follows:

(*Turn to page 711*)



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The can itself is in a machine built for the purpose of seeing how much pressure is needed to make the seams of containers fail.

And the pictures show us just *how* and *where* the event occurs.

We take pictures like this because we're curious. In this case, our curiosity travels as fast as 70 miles per hour, or 4000 exposures per second.

You've got to be eager to know, if you're determined to be the leading can maker in the world.

Cat killers . . .

For you've got to look under every stone . . . tramp up every scientific alley of investigation . . . have the curiosity that kills cats, but makes good scientists . . . if customers are to be served well.

This same attitude and habit of mind applies to everything that's done at the General Research Laboratory of American Can Company at Maywood, Illinois. Solder, enamel, steel, tin, and sealing compounds get the same thorough going over. Processing techniques are being continually investigated and improved. Fundamental research in the nutritive values of canned foods proceeds daily.

Why?

Why all this? Because metal containers play such an important part in American life that they're almost taken for granted.

We feel, therefore, that we have an obligation to make the best metal containers possible.

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NO OTHER CONTAINER PROTECTS LIKE THE CAN

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PLANT OPERATIONS NOTEBOOOK

As long as the supply lasts readers may obtain copies of "A. S. M E. Standard Automatic Control Terminology", reprinted from the last few issues of Chemical Industries.

Clay Pipe Protects Underground Steam Line

In laying underground steam pipes it is necessary to keep the insulating cover of the pipe dry. Metal culvert has been used for this purpose but the metal shortage during the war caused the Birmingham Electric Co. in Birmingham, Alabama to turn to the use of clay channel pipe in the manner shown in the accompanying picture.

Installation is made by laying a slab of concrete 4"-5" thick in the bottom of the trench in which the line is carried. This slab forms a cradle to support the insulated pipe so that it can expand and contract without damage.

Following the concrete, conventional hollow tile is laid on top of the concrete on either side to serve as a support for the clay pipe roof. Laying the half-round clay pipe on the tile provides a roof, forming a clear unobstructed tunnel below.

The bell and spigot ends of the channel pipe are jointed with hot-poured jointing compound and the pipe is also grouted firmly into the tile with mortar to provide a waterproof seal.

Government Issues Data On Benzene Hazards

"Benzene" is the latest pamphlet of the Division of Labor Standards, U. S. Department of Labor, in their Controlling Chemical Hazards series. Fire hazards, storage requirements, fire-fighting phases, and cautions for transporting and handling benzene are covered in chart form.

More detailed precautions for its handling and protection of personnel are given along with a discussions of the symptoms of acute and chronic poisoning. First aid measures are given.

A limited number of copies are available at the office of the Division in Washington while larger orders can be obtained from the Superintendent of Documents at 10c a copy—25% discount on orders of over 100.

NOMOGRAPH-OF-THE-MONTH Edited by DALE S. DAVIS

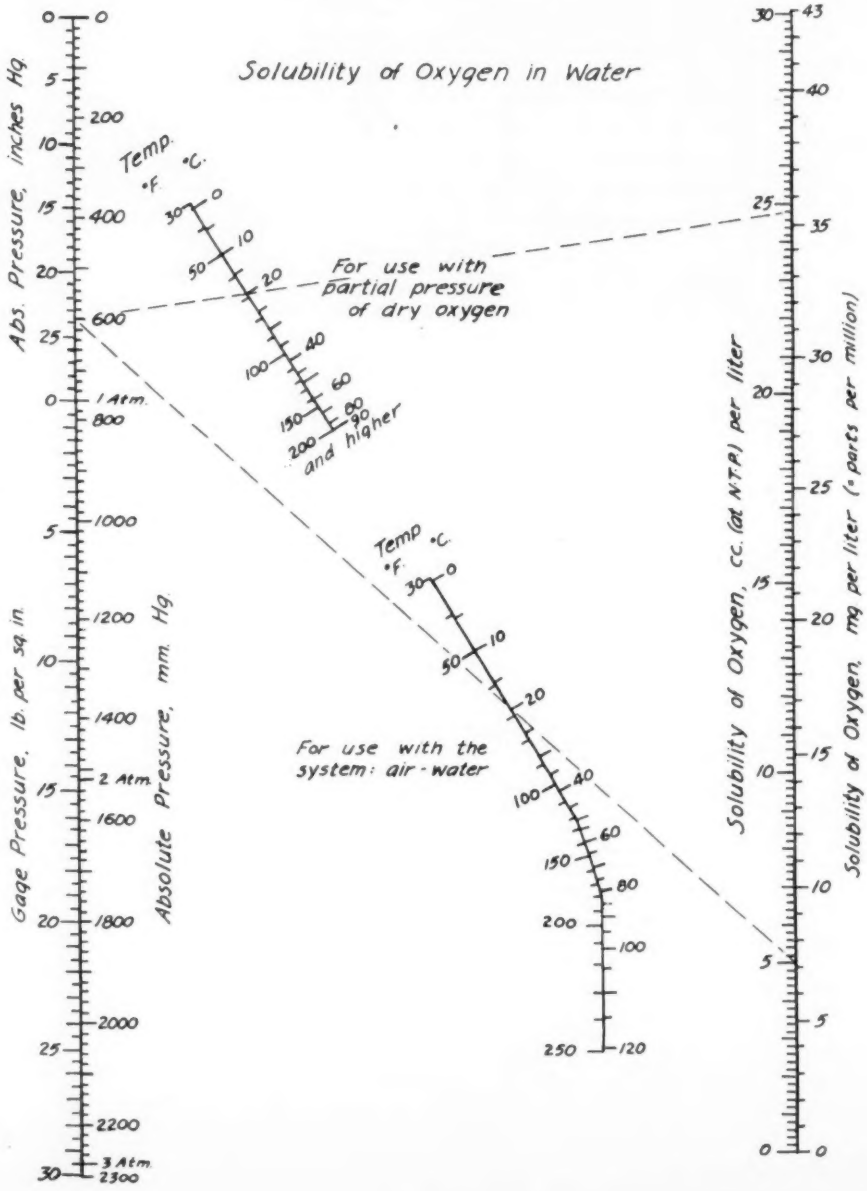
Solubility of Oxygen in Water

by GEORGE E. MAPSTONE

National Oil Proprietary, Limited
Glen Davis, N. S. W., Australia

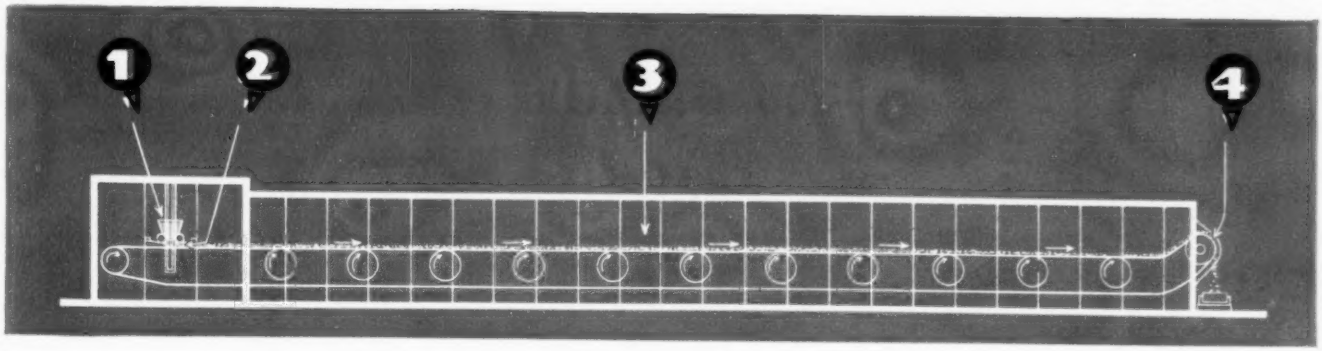
Chemical Industries will be happy to receive any charts that you may have developed so that they may be shared with your fellow engineers. The authors of each chart used will receive an honorarium of $10.

KNOWLEDGE of the solubility of oxygen in water at various temper-



CLAY DRIED TO UNIFORM MOISTURE CONTENT OF 3.1% (B.D.W.B.*) AT RATE OF 2 TONS PER HOUR

*Bone Dry Weight Basis



in PROCTOR CONTINUOUS CONVEYOR SYSTEM

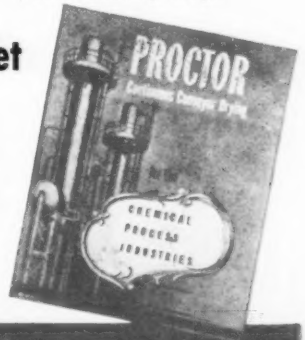
In one typical installation of a Proctor individually designed continuous conveyor drying system, for use in drying clay, here is what takes place. ❶ Wet clay, with a moisture content of 42.1% (B.D.W.B.) is delivered to the pre-forming feed of the dryer, from a continuous filter. ❷ Coming to the hopper of the Proctor rolling extruder feed, in this highly moist state, the material is forced through a perforated plate by rolls moving back and forth, and deposited onto the conveyor of the dryer in spaghetti-like extrusions. This particular Proctor pre-forming feed is ideally suited to the handling of clay, for the initial moisture content and the physical characteristics of this product are such that it will hold a definite shape after extrusion. ❸ Loaded to a uniform depth on the moving conveyor, the clay is conveyed through the drying chambers, where heated air at 212° F. is circulated *through* the bed of material. By forming the clay into these small, uniform shapes, more rapid diffusion is possible, which accounts for rapid drying and the uniformity of the finished clay. ❹ After 42 minutes of drying time, the clay, uniformly dried to a moisture content of 3.1% (B.D.W.B.) is discharged from the dryer at the rate of 4,160 pounds—or more than two tons (C.D.W.†) per hour. Clay, thus dried, in the form of small particles, is uniformly dried all the way through to the center of each particle. This makes possible rapid and complete dispersability in water and, therefore, makes the clay ideally suited to subsequent use.

Proctor continuous conveyor drying systems, with pre-forming feeds, engineered to the individual product requirements, are in operation for a wide variety of wet-solids. It is safe to say that there are hardly two wet-solid drying problems exactly alike; that is why it pays to consult Proctor engineers early when you are considering drying equipment. On the basis of their experience they will be able to make laboratory tests on your product and then translate the results into a recommended system that will meet all of your requirements.

†Commercial Dry Weight

This is a case history taken from this new Proctor booklet

A new 12-page booklet on "Proctor Continuous Drying for the Chemical Process Industries" is available upon request. It contains many case studies showing the application for Proctor individually designed systems. Write for your copy of this informative booklet today.



PROCTOR & SCHWARTZ, INC., Philadelphia 20, Pa.

atures and pressures is frequently required in connection with the operation of deaeration equipment for boiler feed water and for corrosion control in compressed air systems.

The solubility of oxygen in water obeys Henry's law:

$$p = H x$$

where p = partial pressure of oxygen in the gas
x = mole fraction of oxygen in water
H = Henry's law constant.

For most industrial applications, however, this simple relation is complicated by the fact that the measured gas pressure includes the partial pressures of gases other than oxygen. The following equation may therefore be written:

$$k (P - W) = H x$$

where P = absolute total gas pressure over the water
W = partial pressure of water vapor
k = fraction of oxygen in the dry gas.

Both the Henry's law constant, H, and the partial pressure of water vapor, W, vary with temperature, making the calculation somewhat involved. Hence a nomograph is presented to solve the simple equation and also the more complicated equation for the case where the dry gas is air, which contains 21 per cent of oxygen. Data required were taken from Perry's 'Chemical Engineers' Handbook' and Hodgman's 'Handbook of Chemistry and Physics.' Oxygen content of the water is expressed as cubic centimeters (at N.T.P.) or as milligrams per liter.

The chart serves to determine any one of the three variables (solubility, pressure, or temperature) given the other two. The upper temperature scale is used with the partial pressure of dry oxygen in the gas. For off-scale pressures or solubilities, proportional values may be employed. The lower temperature scale is for the total pressure on the system air-water.

The use of the nomograph is illustrated as follows: What is the solubility of oxygen in water at 20° C. when the partial pressure of the dry oxygen is 600 mm. of mercury? Connect 600 on the pressure axis with 20 on the upper temperature scale and read the solubility at the right as 24.8 cc. of oxygen at N.T.P. per liter of water or as 35.5 mg. of oxygen per liter (equivalent to 35.5 p.p.m.)

At 20° C. how much oxygen will dissolve in a liter of water which is in equilibrium with air when the total pressure of oxygen, nitrogen, and water vapor is 600 mm. of mercury? Connect 600 on the pressure axis with 20 on the lower temperature scale and read the desired value at the right as 5.0 cc. of oxygen at N.T.P. per liter or as 7.1 mg. of oxygen per liter (equivalent to 7.1 parts per million.)

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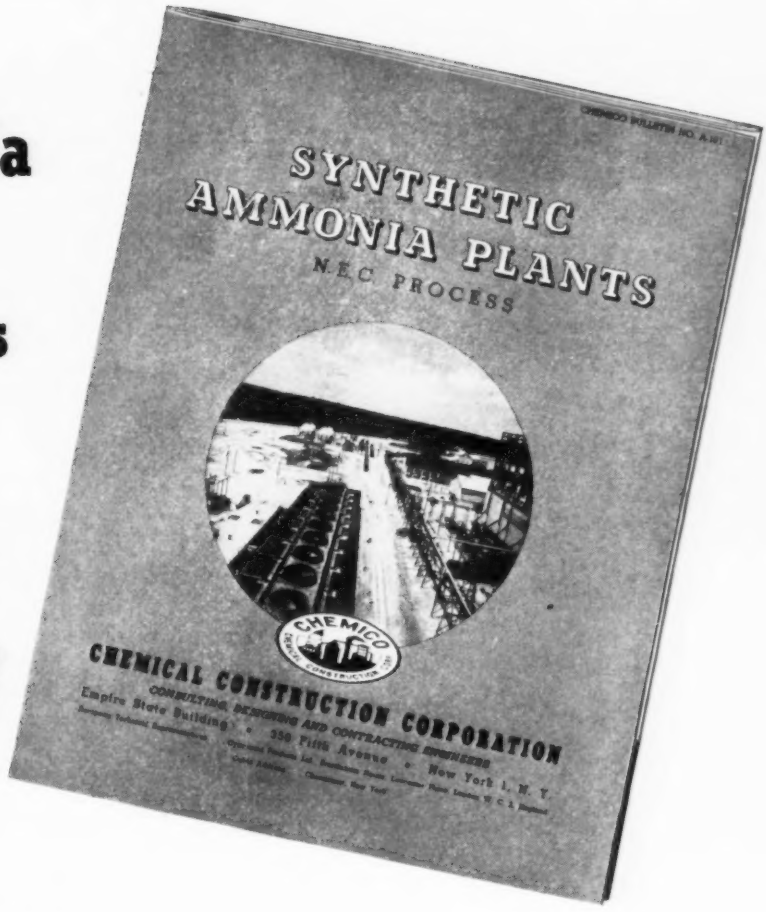
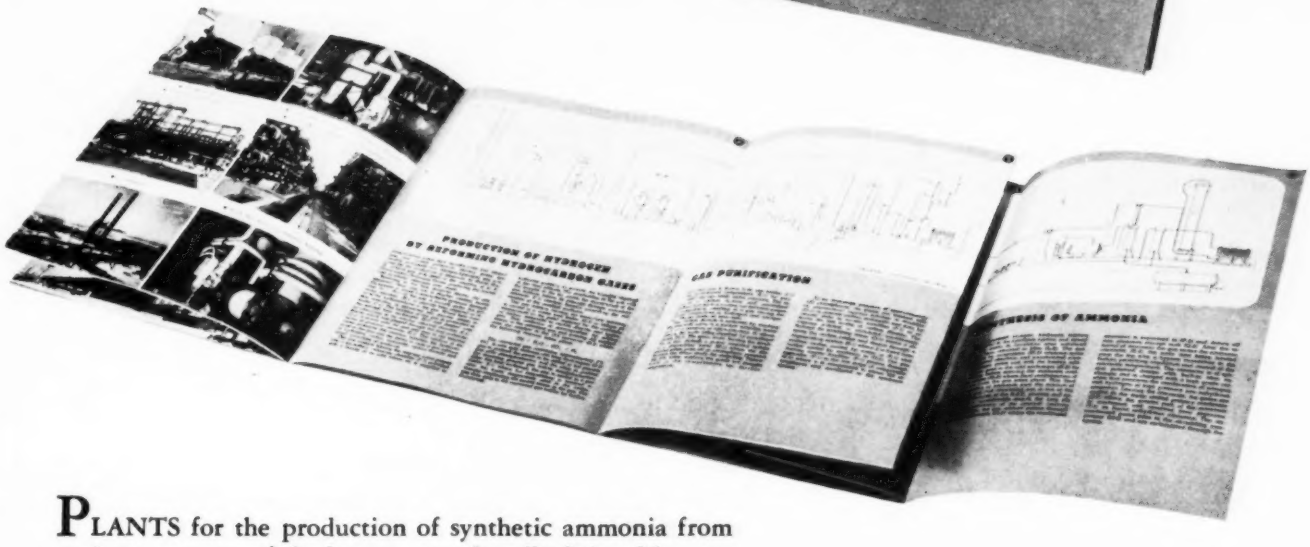
Synthetic Ammonia Production described in this *NEW* CHEMICO BULLETIN





PLANTS for the production of synthetic ammonia from various sources of hydrogen are described in this new 14-page brochure. An unusual presentation of coordinated flow charts illustrates the arrangement of equipment for the three basic types of plants. Numerous photographs clearly show the details of equipment and design.

Executives who are interested in synthetic ammonia production and ammonia plant construction will find this brochure useful in visualizing how CHEMICO can meet their specific requirements.

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LABORATORY NOTEBOOK

Uranium Analysis by Carrier-Distillation

UTILIZATION of uranium as a source of atomic energy requires material of highest purity, because impurities may prevent the nuclear chain reaction through which atomic energy is released. Thirty-three impurity elements, some in concentrations as low as a few tenths part per million, have been detected and estimated through a modified spectrographic method developed at the National Bureau of Standards, used since 1942 in the Manhattan Project for analysis of uranium and its compounds, and reported by B. F. Scribner and H. F. Mullin of the National Bureau of Standards Spectroscopy Laboratory. Solving a major analytical problem, the method has been applied by the National Bureau of Standards to control in the production of these materials.

Some elements interfere in concentrations as low as a few tenths of a part per million. Rapid, sensitive, and accurate methods are therefore required for the determination of at least 60 chemical elements in a variety of uranium-base materials. Prior to 1941, methods for the analysis of uranium to the necessary sensitivity were unknown. Even established spectrographic methods of analysis, so useful in general for detecting minute amounts of impurities, were unsuccesstul because of interference by the highly complex uranium spectrum—a spectrum in which more than 20,000 lines have been observed.

Early in 1941, the Bureau, at the request of the Office of Scientific Research and Development, undertook to adapt spectrographic methods to uranium analysis. It was evident that interference of the uranium spectrum with the spectral lines characteristic of impurities could be overcome only by separating the impurities from the uranium. This was accomplished by the carrier-distillation method.

The uranium sample was converted to a refractory compound having low volatility (the black oxide of uranium, U_3O_8) and distilling the impurities from this compound in a direct-current electric arc.

In order to sweep out the minute quantities of impurity vapors from the sample without volatilizing the uranium, a small amount of a volatile material, termed a "carrier", is added to the sample. Gallium oxide was found most useful as a carrier and is added at a concentration of 2 per cent in the uranium oxide. When the mixture is heated by a direct-current arc in a carbon electrode of special design, the carrier material and impurities are volatilized into the arc. The uranium, remaining as a residue, can be recovered readily from the electrode—an important consideration, particularly with some active forms of uranium.

The spectrogram consists of the simple spectrum of gallium plus the spectral lines characteristic of volatile impurities in the uranium. By a proper selection of wavelengths and suitable photographic plates, a series of spectrograms are made, from the ultraviolet region of the spectrum (2200A) to the infrared (8750A). Characteristic spectral lines, by which 33 impurity elements may be detected at very low concentrations, appear in the region covered.

For quantitative determinations, carefully prepared standards of known composition are submitted to the same treatment as the samples. Amounts of impurities are then estimated by photometric measurement, or by visual comparison of the spectrograms of samples and standards. Determinations are made to an accuracy of ± 10 per cent of the amount of the element present. For example, boron and cadmium can be observed easily at a concentration of 1 part in 10 million, and the concentration can be determined to within one-tenth of this amount. The greatest sensitivity, observed for the detection of silver, was 1 part in 20 million. The elements that are detected by this method and the lower limits of detection are shown in the accompanying table.

Element	*Concentration, ppm*
Silver	0.05
Aluminum	5
Arsenic	5
Gold	0.3
Boron	.08
Barium	10
Berylium	0.1
Bismuth	.5
Cadmium	.07
Cobalt	1
Chromium	3
Cesium	8
Copper	0.3
Iron	1
Germanium	0.2
Mercury	10
Indium	0.5
Potassium	2
Lithium	0.1
Magnesium	.5
Manganese	1
Molybdenum	1
Sodium	0.5
Nickel	2
Phosphorus	50
Lead	1
Rubidium	1
Antimony	10
Silicon	3
Tin	1
Thallium	3
Vanadium	5
Zinc	20

Arc spectrograms in the region 3000 to 3350 Angstrŏm units. In the carrier-distillation method of analysis as applied to uranium-base materials, the spectrum of uranium is suppressed so that the spectral lines of impurity elements may be detected spectroscopically. Spectrogram A resulting from direct arcing of 1 mg of U_3O_8 (black uranium oxide) contains many lines of the uranium spectrum which obscure lines of impurities. In spectrograms B and C, obtained by the carrier-distillation method from 100 mg samples of U_3O_8, spectral lines of impurities may be readily observed and identified; concentration of impurities in (B) is ten times that in (C).

The carrier-distillation method was applied to the analysis of thousands of samples of uranium metal, oxides, and salts. It served both the industrial producers and the Government in controlling the purity of uranium-base materials required in the atomic energy project. Not limited, however, to uranium-base materials, it may be applied to spectrographic analysis of other materials that may be converted to a relatively non-volatile refractory form.

INDUSTRY'S BOOKSHELF

Brief Colloid Survey

COLLOIDS, THEIR PROPERTIES AND APPLICATIONS, *by A. G. Ward,* Interscience Publishers, Inc., New York, 1946; 133 pp., $1.75. Reviewed by H. P. Lundgren, Western Regional Research Laboratory.

IN THE 133 pages that comprise this interesting little book, the author succeeds in his aim to present a brief and up-to-date resume of progress in colloid science in an elementary and non-mathematical way. The contents should help to satisfy the needs of those who keenly feel the gap between the purely popular discussion of colloids and the conventional textbook presentation.

A wide range of subjects is covered in the three parts that comprise this book. Discussed briefly in the first section are current concepts of molecular structure, intermolecular forces, the states of matter, the properties of surfaces, and experimental methods for study of colloids, including the electron microscope.

The second part, of thirty-one pages, deals with stability and other properties of colloidal systems. The third part deals with colloids of industry and living systems; eight pages are devoted to rubber, twelve to cellulose, seven to protein, eight to paints, lacquers, enamels and varnishes, four pages to detergents and five to colloids in biology, the viruses in particular.

Except in only a few instances, the discussion of each subject, while brief, is technically precise. For example, on pages twenty-three and seventy-seven, it is implied that surface tension itself is the deciding factor in the stability of foams; rather, it is the difference in static and dynamic surface tension that is responsible. On page 123 only one model of micelle formation is cited.

This sufficiently untechnical vestpocket introduction to the application of colloids should interest the intelligent layman as well as the student.

New Volume in Organic Reactions Series

ORGANIC REACTIONS, VOL. III, *by Roger Adams, Editor-in-Chief.* John Wiley and Sons, Inc., New York, 1946. 460 pages, $5.00. Reviewed by F. J. Mathews, Professor of Organic Chemistry, Kent State University.

THIS IS the third volume of the new Organic Reactions series and there is no doubt that it will be as enthusiastically received as the first two volumes. This latest volume further serves to illustrate, conspicuously, that the lack of detailed comprehensive discussions of "name" reactions has been a real deficiency in organic literature in the past. That this deficiency will soon be eliminated as more volumes of Organic Reactions are added to the series is a certainty.

The scope and limitations of nine reactions are treated authoritatively with preparations tabulated to give yields, methods, and references. Slightly over 2000 references are cited. The reactions taken up in this volume are listed as follows: Alkylation of Aromatic Compounds by the Friedel-Crafts Method (C. Price); Willgerodt Reaction ($ArCOEt \rightarrow ArC_2H_4CONH_2$) (M. Carmack and M. Spielman); Preparation of Ketenes and Ketene Dimers (W. E. Hanford and J. C. Sauer); Direct Sulfonation of Aromatic Hydrocarbons and Their Halogen Derivatives (C. M. Suter and A. W. Weston); Azlactones (H. E. Carter); Substitution and Addition Reactions of Thiocyanogen, $(SCN)_2$, (J. L. Wood); The Hofmann Reaction (E. S. Wallis and J. F. Lane); The Schmidt Reaction (The reaction of carbonyl compounds and hydrazoic acid to give amines, nitriles, formyl amines, substituted amides and tetrazoles.) (H. Wolff); Curtius Reaction ($RCON_3 \rightarrow RNCO$) (P. A. S. Smith).

Other Publications

THE HANDBOOK OF BASIC ECONOMIC STATISTICS, 1947 annual edition, covering trends of production, prices, sales, and other major aspects of the national economy is available from the Government Statistics Bureau, Washington, D. C., at $3.75. A monthly supplement to the Handbook, containing the current monthly figures and revised figures for earlier months and years, may be obtained for an additional $6.00.

STARCH FOR PAPER COATING is the title of a 120-page, paper-covered booklet, third in a series of Monographs issued by the Technical Association of the Pulp and Paper Industry. Data presented is the result of monthly meetings of the Coating Committee. Free to members, copies may be purchased from TAPPI, 122 East 42nd St., New York 17, N. Y., at $5.00 per copy. ($6.00 in Canada and other countries.)

HANDBOOK OF CHEMISTRY by Norbert A. Lange, sixth edition, is only slightly larger than the previous editions, but it offers considerable new material, particularly in the section on "Physical Constants of Inorganic Compounds". This has been made possible by the elimination of certain data relating primarily to engineering. Revisions have been made throughout the book to bring it up to date. Handbook Publishers, Inc., Sandusky, Ohio. Price $6.00.

TEXTILE CHEMICAL SPECIALTY GUIDE, 1946-7 edition, is the fourth edition of this buyers' guide to textile chemical products. The products are classified according to their use, and they are also listed by company. 193 manufacturers are listed. Textile Book publishers, Inc., 303 Fifth Ave., New York 16, N. Y. $5.00 in U. S. and Canada; $6.00 in other countries.

MESON THEORY OF NUCLEAR FORCES by Wolfgang Pauli introduces the theory of nuclear forces by means of the charged and neutral mesons. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Price $2.00.

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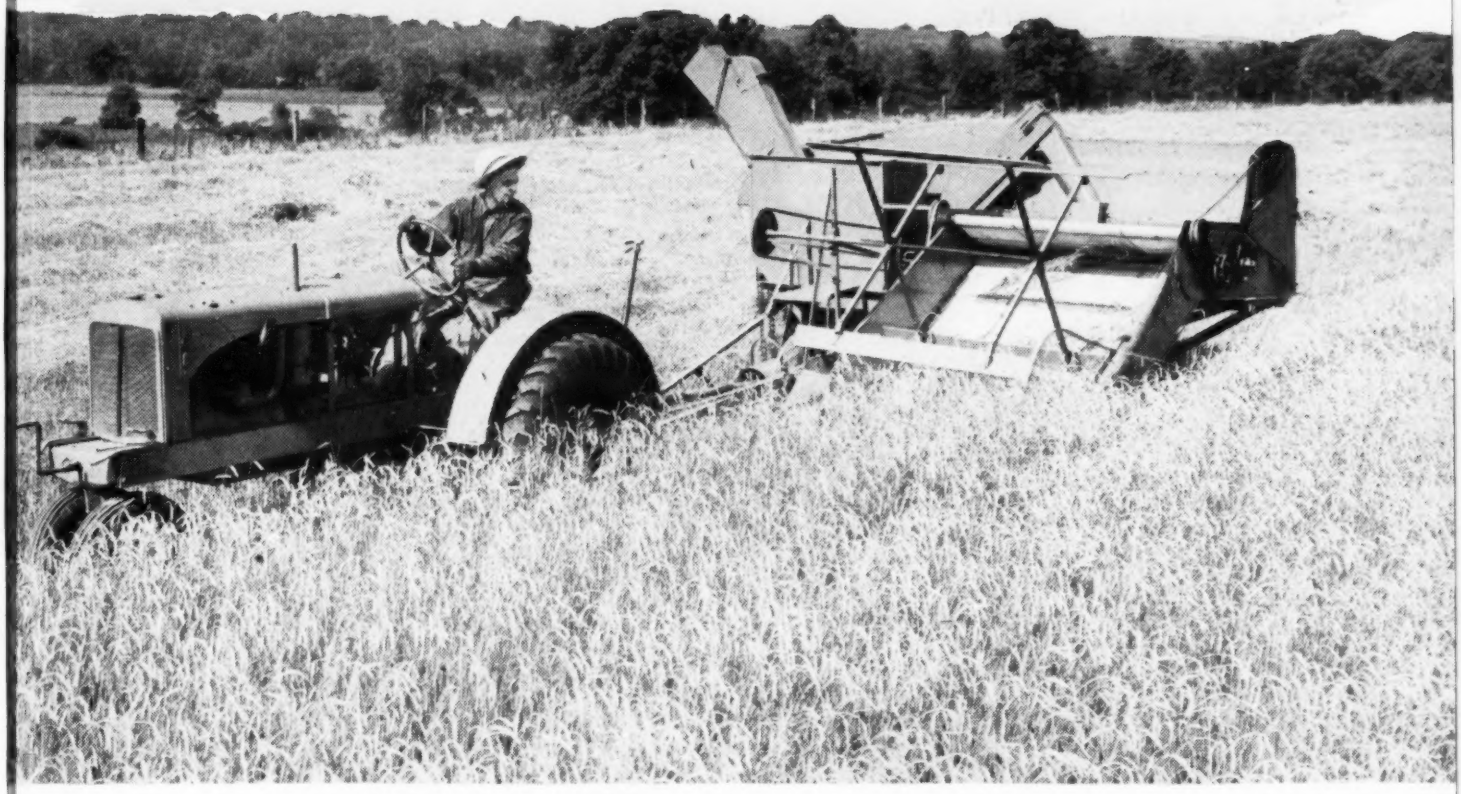

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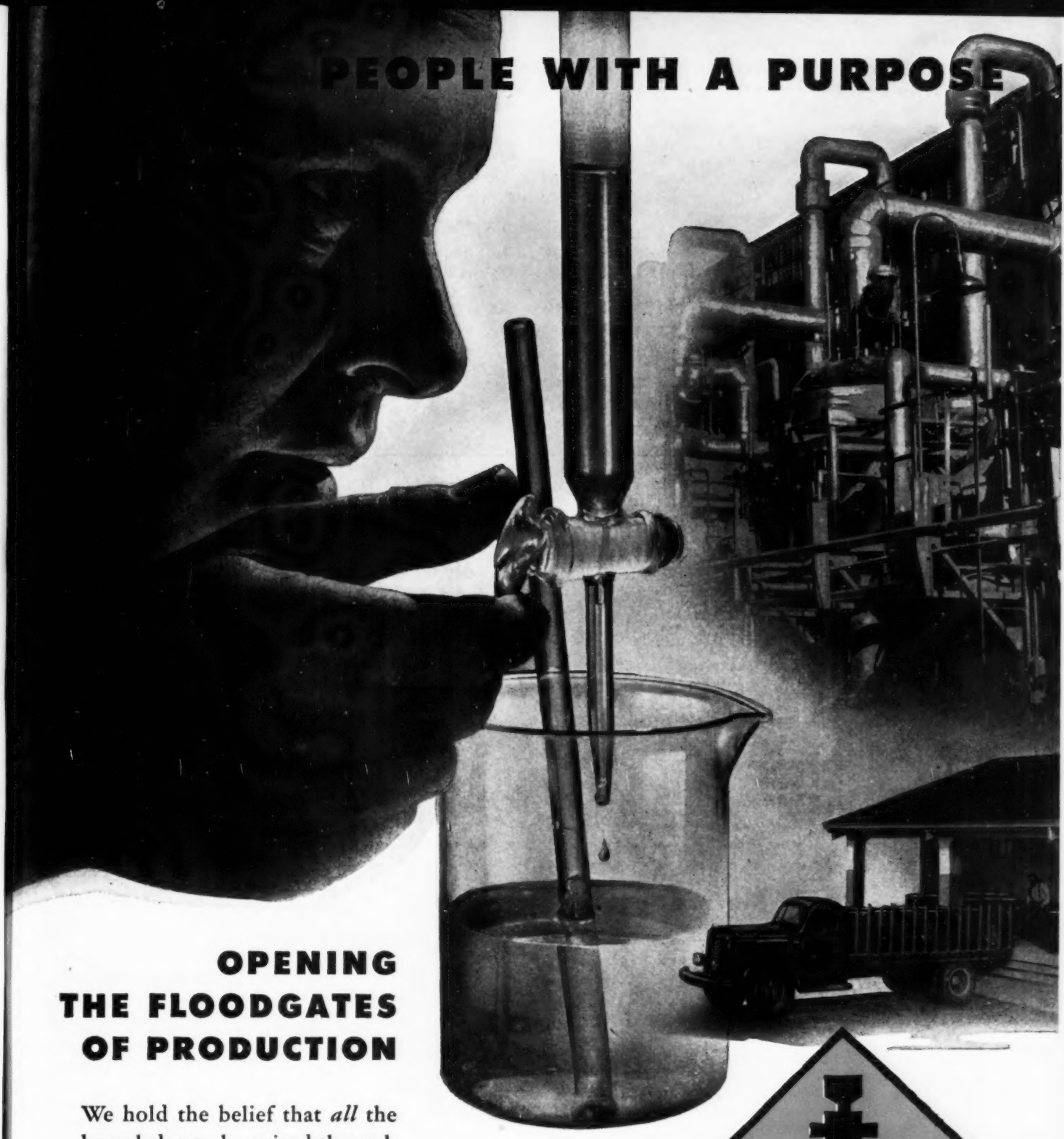

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G224. POWER SUPPLY. "Seco DC Power Supply," 1 pg. (No. 11462), Superior Electric Co.

G225. PUMP GOVERNORS. "Engineering, Operating & Maintenance Data on Pump Governors," 16 pp. (No. 463), Leslie Co.

G226. PUMPS. "Chemical Pumps Built of Ircamet," 12 pp. (No. 7095), Ingersoll-Rand Co.

G227. PUMPS. "Controlled Volume Chemical and High Pressure Pumps," 28 pp., Milton Roy Pumps.

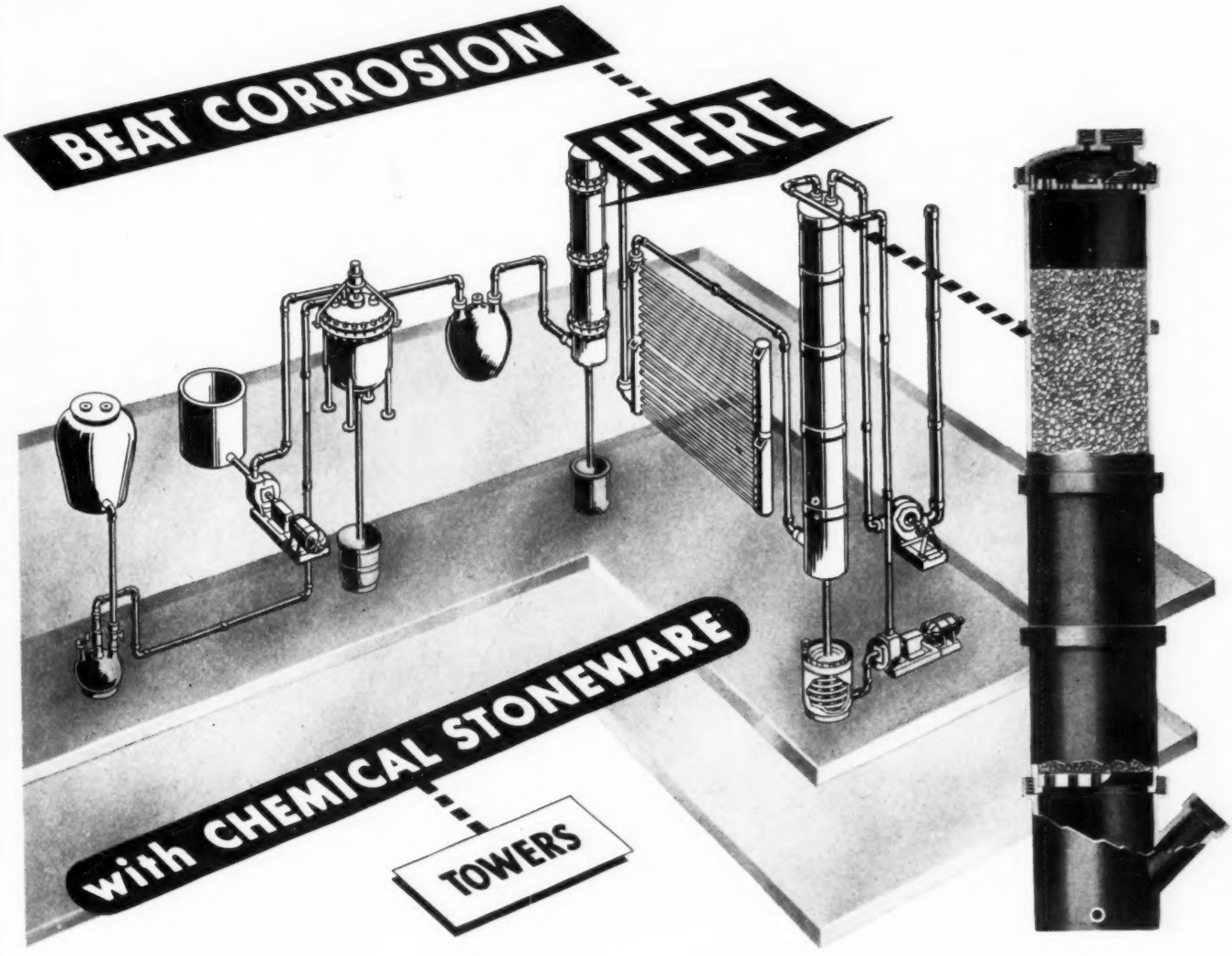
G228. ROTOMETER. "Dimension Drawings for series 700 Flowrator". 11 pgs., Catalog Section 27-A, Fischer & Porter Co.

G229. TANKS. "Aeroil Electrically Heated Double Vat Waxmaster Tanks." 2 pgs., Leaflet No. 581, Aeroil Products Co.

G230. VALVES. "Pressure Reducing Valves Developed to Fit Your Equipment." 4 pgs., Bulletin No. 199, A. W. Cash Valve Manufacturing Corporation.

G231. SYNCHRONOUS TIMING MOTOR. "Cramer Self-Starting Synchronous Timing Motor," 4 pgs., Bulletin No. 10, The R. W. Cramer Co., Inc.

G232. WELDERS. "Motor Operated Flash Welders" (No. 204), Progressive Welder Co.



If your process calls for: **FUME ABSORPTION, REACTION OF GASES AND LIQUIDS, AND DISTILLATION**, with corrosive gases and liquids, General Ceramics chemical stoneware towers have a place in your flowsheet. These chemical stoneware towers are not only corrosion-resistant, but – against the attack of all acids except hydrofluoric – ACTUALLY CORROSION-PROOF!

Towers, one of the most important tools of the chemical engineer, are often the key point in a process – thus exceptionally vulnerable to weakness from the standpoint of either corrosion or design. General Ceramics towers are built from selected clays, carefully processed, constructed by skilled workmen and designed by chemical engineers with many years experience in the process industries. In every detail – density, thermal shock, resistance, mechanical strength, AND RESISTANCE TO ALL ACIDS except hydrofluoric – General Ceramics chemical stoneware towers are *built to do their job*. When selecting a tower for your flowsheet, remember that GENERAL CERAMICS CHEMICAL STONEWARE TOWERS:

- **WON'T CORRODE**
- **ARE DESIGNED TO MEET YOUR REQUIREMENTS**
- **COVER A WIDE RANGE OF SIZES AND SHAPES**

Send for Bulletin HA which describes our standard line of Bell and Spigot towers. Or, if your process requires special equipment, send full details to our Keasbey office or any of the district offices shown below. WHEN CHEMICAL STONEWARE GOES IN, CORROSION GOES OUT.

GENERAL CERAMICS AND STEATITE CORPORATION
CHEMICAL EQUIPMENT

2356

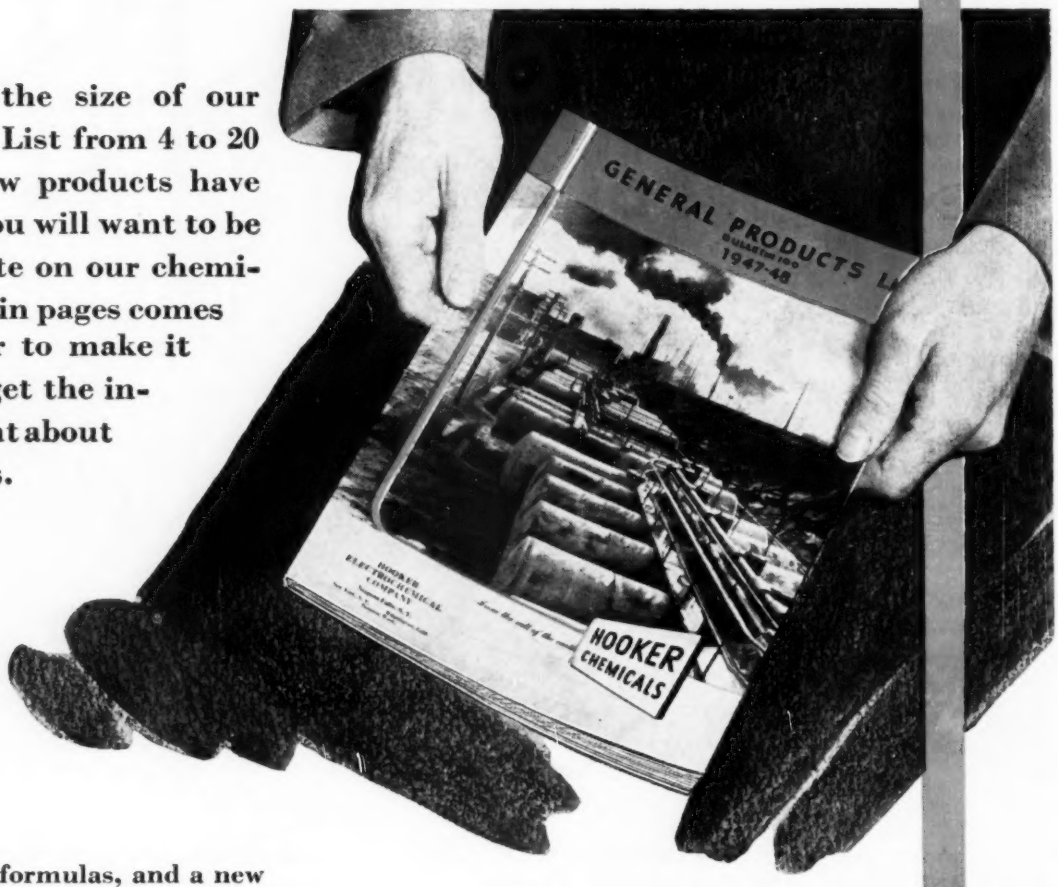
BUFFALO: 610 Jackson Bldg. **CHICAGO:** 20 N. Wacker Drive
LOS ANGELES: 415 So. Central Ave. **PORTLAND 5, ORE.:** 410 New Fliedner Bldg.
NEW YORK: 30 Broad Street • **SEATTLE:** 1411 Fourth Ave. • **SAN FRANCISCO:** 598 Monadnock Bldg.
TACOMA: 417 Tacoma Bldg.
MONTREAL: Canada Cement Bldg. • **TORONTO:** Richardson Agencies, Ltd., 454 King St., West
VANCOUVER, B.C.: Willard Equipment Ltd., 860 Beach Ave.

General Ceramics
AND STEATITE CORP.
CHEMICAL EQUIPMENT DIVISION
KEASBEY, NEW JERSEY

In addition to the manufacturing facilities of the Chemical Equipment Division those of the Insulator Division are also available for handling ceramic problems in all branches of industry. General Ceramics & Steatite Corporation is therefore able to offer service covering all industrial applications of ceramic products.

Get the Facts on Hooker Chemicals from our New General Products List

We've increased the size of our General Products List from 4 to 20 pages. Several new products have been added and you will want to be brought up to date on our chemicals. The increase in pages comes from an endeavor to make it easier for you to get the information you want about Hooker Chemicals.



Larger type, graphic formulas, and a new format facilitate your finding the chemicals in which you are interested. Included are description, principal physical and chemical properties, uses, and shipping containers. This new products list also describes briefly the various chemical processes and facilities which Hooker has available for industry.

You who are not yet acquainted with Hooker Chemicals will find this new Products List an excellent introduction to a source for industrial chemicals of high purity; it will also pay you to refer to this Bulletin whenever you need chemicals. Feel free, too, to call on Hooker's Technical Staff for advice and help on the application of Hooker Chemicals to your problems.

The words "Bulletin 100" on your business letterhead will bring you a copy of the Hooker General Products List.

HOOKER
ELECTROCHEMICAL
COMPANY

3 Forty-Seventh Street, Niagara Falls, N. Y.
New York, N. Y. Wilmington, Calif.
Tacoma, Wash.

HOOKER CHEMICALS

From the salt of the earth

Caustic Soda
Paradichlorbenzene
Muriatic Acid
Chlorine
Sodium Sulfide
Sodium Sulfhydrate

NEWS OF THE MONTH

Features of Patent Office Reorganization

Outstanding features of a reorganization of the U. S. Patent Office, as disclosed recently, include:

Appointment of an Executive Examiner for Trade Mark Operations, to coordinate all trade mark activities. It is expected that this office will be considerably expanded in the next six months to meet provisions of the Lanham Trade Mark Act.

Re-grouping of the corps of patent examiners, to expedite handling of patents and applications.

In the last half of 1946, a total of over 43,000 applications for patents was filed, including re-issues. As of January 24, there was a backlog of 130,481 patent applications, 7,779 design applications, and 12,451 trade mark applications, awaiting action.

Edwal Promotes Lowe

E. W. Lowe, appointed chairman of the board of directors of Edwal Laboratories Inc., Chicago. One of his major responsibilities will be the management of the concern's new Ringwood development.

Charge Legislation Hits Private Enterprise

The National Fertilizer Association has expressed definite opposition to H. R. 2424 because of its similarity to the Hill-Bankhead-Flanagan bills of the previous session. Major contention: it would establish wide government powers in fertilizer production and controls.

The Association charges that the bill, "under the guise of establishing a national test-demonstration program, would provide for government construction of a large phosphate plant by TVA at Mobile, Ala., then arrange for its products to be distributed free to not more than 1 out of every 50 farms in each state. TVA would acquire reserves of phosphate rock properties in Florida, for use by these plants."

Natural Gas Investigation Report

The Federal Power Commission has started issuance of its report covering the exhaustive natural gas investigations of the past year. The report is being published in sections.

A significant finding of the Commission in recent sections holds that the Commission does not have authority over production or processing of natural gas prior to its transportation or sale by others for resale in interstate commerce. However, this disclaimer is reported to fall short of what oil and gas industry representatives had wanted.

They are particularly watchful of the Commission position that no Congressional amendment is needed on this point; that an administrative clarification, such as an FPC statement of policy would be sufficient to dispel the confusion which exists.

Industry reaction is that there is still too much latitude for arbitrary rulings in the Act.

Japanese Patents Received

Some two hundred thousand wartime Japanese patents are now available to the public at the Patent Office Library in Washington, according to a recent report. As yet, however, the patents have not been translated or classified.

Heretofore no comprehensive survey of scientific and technological developments in Japan has been made, although German advances have been thoroughly scrutinized.

Major Expansion for Commercial Solvents

As part of a $13.5 million expansion program Commercial Solvents Corp. has begun construction of a new unit for the manufacture of methanol. It is expected that the project will triple the company's productive capacity for this chemical. Estimated cost: $4.3 million. Initial operation: early next year.

Other expansions scheduled include increased facilities for benzene hexachloride at Terre Haute, Ind., crystalline penicillin salts, anhydrous ammonia, riboflavin food supplements, and formaldehyde. No commitments have been made regarding large-scale output of streptomycin and tyrothrycin as yet, for although manufacturing processes have been developed the potential market is still not clearly defined.

The company has begun construction of a new formaldehyde plant at Agnew, Cal., and some $1,180,000 is being invested in the Peoria, Ill., riboflavin unit. An expansion of crystalline penicillin output is also scheduled.

Net sales of the corporation reached an all-time peak of $41,874,998 last year, compared with 1945's $40,284,861. Net profits at $5,719,779 were more than double the $2,033,418 of the preceding year.

Dinges Joins Spencer

H. R. Dinges, formerly with Mathieson Alkali Works Inc., has assumed the post of sales manager of Spencer Chemical Co.'s Chemical Division. He will make his headquarters at Charlotte, N. C.

Petroleum-Sulfur Information Available

As a part of a research program designed to assist refiners in utilizing high-sulfur crude oils, the Bureau of Mines has compiled information on the physical properties of several sulfur compounds likely to be found in petroleum.

Based on cooperative work between the Bureau and the University of Wyoming, at Laramie, Wyo., a new publication now available for free distribution to the industry lists the boiling points, freezing points, densities, and refractive indices of more than 300 sulfur compounds.

A copy of the publication, Report of Investigations 4060, "Sulfur in Petroleum; II. Boiling Points, Freezing Points, Densities, and Refractive Indices of Some Sulfur Compounds," may be obtained by writing to the Bureau of Mines, Department of the Interior, Washington 25.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, 32nd annual convention, Hotel President, Kansas City, May 19-23.
AMERICAN CERAMIC SOCIETY, annual meeting, Atlantic City, April 21-25.
AMERICAN COUNCIL OF COMMERCIAL LABORATORIES, Los Angeles, May 26-27.
AMERICAN GAS ASSOCIATION, Joint Production and Chemical Committee Conference, Hotel New Yorker, New York, June 2-4.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, regional meeting, St. Louis, Mo., May 11-14.
AMERICAN LEATHER CHEMISTS ASSOCIATION, annual meeting, Edgewater Beach Hotel, Chicago, June 18-21.
AMERICAN OIL CHEMISTS' SOCIETY, annual meeting, Hotel Roosevelt, New Orleans, May 20-23.
AMERICAN PHARMACEUTICAL MANUFACTURERS' ASSOCIATION, annual meeting, Boca Raton Hotel, Boca Raton, Florida, April 28-30.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS, semi-annual meeting, Stevens Hotel, Chicago, June 16-19.
AMERICAN SOCIETY FOR TESTING MATERIALS, 50th annual meeting, Atlantic City, June 16-20.
CHEMICAL INSTITUTE OF CANADA, annual conference, Banff, Alberta, Canada, June 8-11.
METAL POWDER ASSOCIATION, third annual Spring meeting, Waldorf-Astoria, May 27.
NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS, INC., mid-year meeting, Hotel Edgewater Beach, Chicago, June 9-11.
NATIONAL FERTILIZER ASSOCIATION, Essex and Sussex Hotel, annual meeting, Spring Lake, N. J., June 19-21.
NORTHEASTERN WOOD UTILIZATION COUNCIL, Hotel New Warden, Saratoga Springs, June 13.
SOCIETY OF THE PLASTICS INDUSTRY, second national Plastics Exposition, Coliseum, Chicago, May 6-10.
SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION, Spring outing, Seaview Country Club, Absecon, N. J., May 26-28.
XIth INTERNATIONAL CONGRESS OF PURE AND APPLIED CHEMISTRY, London, July 17-24.

Cement Case To Supreme Court

The U. S. Supreme Court has agreed to hear Federal Trade Commission charges alleging violation of the anti-trust laws and monopoly practices against a major segment of the cement industry, following an earlier reversal of the Commission in a Circuit Court of Appeals.

The F. T. C. initiated its case in 1937 against the Cement Institute, including some 75 member corporations engaged in production and sale of cement. The principal object of Commission attack was the basing point price system established by the defendant companies, which the Commission alleged was discriminatory.

Sulfadiazine Patent Disputes

A board of arbitration, appointed under the auspices of the American Arbitration Association, has handed down a decision in favor of Sharp & Dohme in its claim against American Cyanamid Company for accrued royalties on sulfadiazine amounting to approximately $1,750,000.

The decision was the culmination of a dispute over a contract entered into by the two companies in 1941. By this contract a license to manufacture and sell sulfadiazine was granted by Sharp & Dohme to American Cyanamid. The license was subject to the payment of royalties if covered by a claim of a patent held by Sharp & Dohme.

American Cyanamid claimed the patent did not cover sulfadiazine. In accordance with the contract, the question was submitted to arbitration.

Hoffman Wins Hillebrand Prize

James Irvin Hoffman, National Bureau of Standards, awarded the 1946 Hillebrand Prize for his work on the development of uranium purification processes and the extraction of alumina from clay.

Reports Released by the OTS

The following reports have been issued recently by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Orders should be directed directly to OTS, accompanied by check or money order, payable to the Treasurer of the United States:

DETAILS OF PROCESSES and machines for dyeing synthetic fabrics, together with formulas for many types of dyes and textile auxiliaries: PB-50759; microfilm, $1; photostat, $3; 43 pages; and PB-50758; microfilm, $3; photostat, $8; 109 pages.

ANODIC OXIDATION methods for processing aluminum and alloys: PB-49275; photostat, $3; microfilm, $1; 33 pages including diagrams.

FORMULAS FOR FACE CREAMS, perfumes, soaps, shampoos and other cosmetics, with reference to German use of synthetic waxes, oils, emulsifiers, and aromatics: PB-47526; microfilm, $3; 109 pages.

VISCOSITY-MEASURING DEVICE to determine useful life of ready-mixed resin glues: PB-42297; microfilm, $1; photostat, $2; 19 pages.

AUTOMATIC HIGH-SPEED device for recording ultraviolet absorption spectra of chemicals: PB-46540; photostat, $2; microfilm, $1; 30 pages including diagrams and photos.

CERAMIC MATERIALS developed to withstand high temperatures, such as heat of gases in gas turbine engines: PB-4260; photostat, $1; microfilm, 50 cents; 29 pages.

METHODS OF PREVENTING nickel-plating failures, with bibliography of literature: PB-47009; microfilm, $1; photostat, $2; 24 pages.

POLYSTYRENE FILM for plate insulation on fixed-value condensers, describing production of film and characteristics, and manufacture of condensers: PB-49191: photostat, $1; microfilm, $1; mimeographed, 25 cents; 10 pages. Film production: PB-44965; photostat, $2; microfilm, $1; mimeographed, 75 cents; 32 pages including drawings.

TORSIOMETER, used for measuring consistency and elasticity of sticky gelatinous materials: PB-46446; photostat, $6; microfilm, $2; 76 pages, including drawings, photos, and tables.

DETERIORATION OF TEXTILES, wood, leather, etc., when subject to attack by weather, bacteria or fungi: bibliography. Mimeographed copies, free. Title: Deterioration.

FORMAMIDE PRODUCTION from interaction of methanol, carbon monoxide, and ammonia: PB-44962; microfilm, $1; photostat, $1; 13 pages.

Chemicals Wanted

The following chemicals are wanted by the National Registry of Rare Chemicals, Armour Research Foundation, 33 Federal and Dearborn Sts., Chicago 16:

Trihexylamine
Cupric metaborate
Silver tetraborate
Mercuric metatellurate
1-Methylanthracene
N,N-Dimethyl-o-phenylene diamine
Phosphopyruvic acid
Pentamethylene diamine
1,2,3,4-Tetrachlorobenzene
p-Diethylaminoaniline
Tetramethylene diisocyanate
Fenchyl alcohol
Sodium pentathionate
m-Ethyltoluene
2-Aminobutyrolactone hydrobromide
5-Chloropentanone-2
Hexamethylacetone
Osmium octafluoride
1,2,3,4-Butane tetracarboxylic acid dianhydride
Tantalum pentachloride, bromide and iodide
Columbium pentachloride, bromide and iodide
1-Butyne

COMPANIES

The HOVEY PETROLEUM CO. has completed plans for construction of a $200,000 paraffin wax-asphaltum plant in the Houston area.

The new company will be known as the Paraphalt Wax Corp. of America. Dr. Ernest Stossel, a graduate of Vienna University and head of similar projects in South America, will be president.

LIQUID CARBONIC CORP. plans an increase of 50 per cent in the capacity of its Los Angeles plant this year, and expects to add a third unit to its Belleville, N. J., facilities in 1948. In 1948 it also has scheduled the addition of one oxygen and one acetylene projcet, and

one oxygen, and two carbonate plants in the following year.

HEYER CHEMICAL Co. has been founded by Walter R. Heyer and will function as a Mid-west distributor of industrial and medicinal chemicals. Offices are at 221 North La Salle St., Chicago 1.

MILTON HARRIS ASSOCIATES has changed its name to Harris Research Laboratories and formed an affiliated organization, Harris Instruments, Inc. The latter organization will be engaged in instrumentation research and the manufacture of research instruments.

THE DU PONT COMPANY has received CPA approval for the construction of a new unit at its Deepwater, N. J., plant for the manufacture of Monastral pigments. Hitherto limited production of these materials has been carried on in temporary facilities because war conditions prevented plant construction. Work on the new unit will begin this month.

JULIUS HYMAN & Co., INC., has begun production of its insecticide, tradenamed Octa-Klor, at its Denver, Col., plant. The Hyman organization was established four months ago.

The Tennessee phosphate division of INTERNATIONAL MINERALS & CHEMICAL CORP. will build a new unit within the next two years, according to recent reports. During 1946 and 1947 expansion of the corporation's Florida activities are also scheduled to add 1,500,000 tons to International's capacity.

Rippeteau Joins Wyandotte

W. L. Rippeteau, formerly a research development engineer with Phillips Petroleum Co., has joined the development department of Wyandotte Chemicals Corp. He will serve as a new products contact representative.

FREEPORT SULPHUR Co. has acquired the assets of the estate of the late U. C. Tainton and will carry on research and development work at the Tainton Laboratory in Baltimore. Such operations will be conducted under the name of TAINTON PRODUCTS Co., a division of Freeport. The assets acquired include various metallurgical processes, products, and domestic and foreign patents.

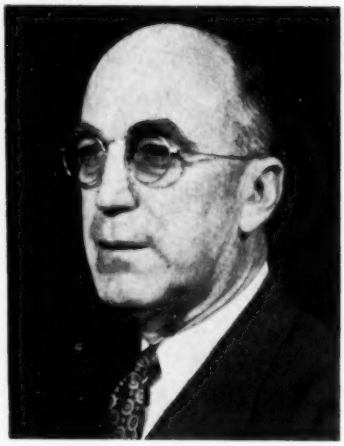
ELI LILLY & Co. has formed ELI LILLY & Co. OF INDIA, INC., with headquarters in Indianapolis. Offices are also being established in Bombay, India.

WITCO CHEMICAL Co., New York, is constructing at its present plant in the Clearing District of Chicago a metallic stearates manufacturing unit to serve the midwest area. The plant is expected to begin operations May 1st. The new unit will supplement the production of the present plant in Brooklyn, New York.

MONSANTO CHEMICAL Co. plans the construction of additional elemental phosphorous facilities at its Columbia, Tenn., plant. Estimated investment: $2 million. The project, scheduled for 1948 completion, will up the company's phosphorous output by about 50 per cent.

GASTON JOHNSON Co., New York, has been appointed sales agent for the Chemical Industries of Mo och Domajo Aktiebolag, Stockholm. Major products: ethyl hydroxy ethyl cellulose, tall oil, fatty acids, abietic acid, carene, pinene, methanol, and ethanol.

Morley Advanced To Vice-Presidency



L. M. Morley, vice-president of the Brown Instrument Co., elected a vice-president of the parent Minneapolis-Honeywell Regulator Co. He has been with the organization since 1919.

CANADA

Dominion Tar Expands

Dominion Tar & Chemical Co. Ltd., Montreal, major Canadian producer of tar-derived chemicals and a leading producer of common salt, reports net earnings of $1.2 million in 1946, almost double 1945's $706,000.

The company's plans for this year, according to Arthur O. Ponder, president, involve an additional capital investment of more than $2 million. Apart from new facilities for the manufacture of dinitro ortho cresol, and construction of a western salt refinery, the company's Toronto phthalic anhydride unit is to be extended so that productive capacity will be tripled. In addition the affiliated naphthalene plant will be expanded.

Potash Deposits Unveiled

Even though Canada has bounteous mineral resources, the Dominion has been barren in one respect. There are no known, economically-workable deposits of potash.

But this month an interesting report from Saskatchewan stated that a rather promising potash deposit has been discovered 100 miles north of Saskatoon. According to Hon. J. L. Phelps, Minister of Resources, an 11 foot potash-bearing strata, containing 23 per cent K_2O was encountered last July at a depth of 3,475 feet. It is estimated that some ten additional wells will have to be sunk before the field can be proved.

The fact that the Saskatchewan government has seen fit to officially reveal the existence of the potash bed is particularly signficant. For hitherto the exploratory work (CI-Feb. 1945, p. 321) has been shrouded in utmost secrecy.

CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

Major Market for DDT in Apple Sprays

Extensive 1946 tests with DDT in experimental and commercial apple orchards confirm earlier conclusions that this material is highly effective against the codling moth, the U. S. Department of Agriculture reports. DDT will probably be used in one-third to one-half of the country's apple orchards in 1947 in at least part of the program to control the codling moth, if supplies are adequate. Water dispersible powder is the most common form in which DDT is applied for this purpose, although dusts and other formulations have given good results in limited tests, according to the Bureau of Entomology and Plant Quarantine.

DDT has not yet received unanimous unqualified endorsement for codling moth control, chiefly because of the effect of its use on the abundance of pests other than the codling moth, such as various species of orchard mites, the woolly apple aphid, and the red-banded leaf roller. Dosages of DDT ordinarily used for codling moth control appear to be ineffective against these pests but kill off the natural enemies that ordinarily hold them in check.

USDA Suggests Use of Term Chlordane

The United States Dept. of Agriculture has recently issued a memo which designated the insecticidal toxicant heretofore known by the empirical formula $C_{10}H_6Cl_8$ as Chlordane-1,2,3,4,5,6,7,8,8 octachloro-4,7-methano-3a,4,7,7a-tetrahydroindane.

It is proposed that the term technical chlordane be permitted in formulation labelling, with technical chlordane indicating a content equivalent to 60 per cent octachloro-4,7-methano-tetrahydroindane and 40 per cent related compounds.

All-Out Specialty Marketing Campaign

Four years ago Sherwin-Williams tossed exclusive-agent precedent overboard and went full tilt after dealers for its water-emulsion paint, Kem-Tone. Any merchant in good standing was permitted to handle the item, and 65,000 new retailers were lured into the fold. Since then high-pressure selling has moved some 27 million gallons of the product.

Now the company is conducting a similar, but somewhat more extensive campaign, in an effort to broaden distribution of its non-paint products—including Bug-Blaster, Weed-No-More, and Pestroy. Some 700 specially trained salesmen are assigned to a nation-wide campaign. Objective: 98,000 new outlets. Incentives: 67 per cent dealer markup, displays, literature.

S-W is also counting heavily on its 500 company-owned stores in the present campaign. For these will supply the new outlets with the non-paint lines, and minimize costly warehousing problems.

It is no secret that S-W is planning additions to its specialty line. And when more outlets have been established there is no doubt that more products will be added—rapidly.

Introduce Novel Label Adhesive

An all-purpose labeling and protective coating adhesive, developed by National Adhesives, New York, during the war, is now available for peacetime industrial applications. It was used extensively by the Air Service Command for both labeling and over-coating containers.

Known as "Resyn Adhesive Q3605," the product has been found to be of value for labeling industrial chemicals packaged in bulk, where positive and permanent identification is necessary from a safety standpoint, whether metal drums, glass bottles or other varieties of containers are used.

Powell Expands on West Coast

The West Coast plant of John Powell, San Leandro, Calif., is now producing DDT concentrates, pyrethrum, rotenone and benzene hexachloride on a 24-hour-per-day basis, according to Esler Johnson, manager of John Powell & Co. of Calif., Inc.

According to Mr. Johnson, whose office is at 503 Market Street, San Francisco, the recently-completed plant will supply a complete line of Powco Brand materials on the West Coast. Emphasis will be placed on increased service to Western industry and agriculture.

Geigy Small-Packages Gesarol

Geigy Co., Inc., has extended the range of sizes of its Gesarol E 25 emulsifiable DDT composition to include one gallon cans. Hitherto this product has been sold only in 55 gallon drums.

Gesarol 25 contains 25 per cent DDT (by weight) and will remain stable at temperatures as low as zero F. It is sold mainly for agricultural purposes—particularly to potato growers—and is diluted on the basis of 2 pints of concentrate to 100 gallons of water.

Apart from controlling potato pests, such as the Colorado potato beetle, flea-beetles, and aphids, DDT has also proved valuable as a means of combating greenhouse leaftiers, thrips on chysanthemums and snapdragons, rose aphids, and kindred insects.

Innis, Speiden Advances Sheffield

W. H. Sheffield, Jr., elected secretary, Innis, Speiden & Co., New York. Also assistant treasurer of the concern, he is a member of the board of directors.

Pennsalt Adds to Weedkiller Line

Knox-Out Weeds Liquid, a new 2,4-D formulation, is now being sold by the Pennsylvania Salt Manufacturing Co.

One pint of the liquid, mixed in 20 gallons of water, should suffice to treat 4000 square feet of planted surface, according to the maker.

It is packaged in 8-ounce and one pint glass bottles, and will be sold in addition to Knox-Out Weeds, the powdered 2,4-D preparation which Pennsalt introduced last year.

Whiz Promotes Lighter Fluid Sales

A new packaged lighter fuel, tradenamed Whiz Flick Flash, is being introduced by R. M. Hollingshead Corp., Camden, N. J.

The new product is described as an odorless, smokeless, sure-lighting fuel, and is packaged in lithographed cans. It will be marketed through grocery channels in collaboration with William F. Wolf, Inc., New York, with national sales to be developed through local grocery product brokers.

The company has also moved its Dallas, Texas, branch office and warehouse from

2033 Commerce St. to a new 10,000 sq. ft. building at 2911 Taylor St. It is anticipated that sales of this branch will exceed $600,000 during 1947, according to P. C. Franzine, division manager.

Introduce DDT Coating Compound

A product said to combine the advantages of DDT and whitewash has been introduced recently by Tykor Products Inc., New York. It is being marketed under the tradename Tykor Insecticidal White.

The compound actually contains no lime, but dissolved in water can be used for the application of a whitewash-like coating on metal, wood, or stone.

It is packaged in 50 lb. bags, and the manufacturer plans to cultivate the farm market, and sell the material for use in storage rooms and basements.

Nopco Sales and Earnings Up

The largest sales and earnings in the history of the company were reported by National Oil Products Co. in its annual review of activities. Total sales rose from 1945's $15,270,213 to $16,951,352, with net income amounting to $1,012,735 after all charges and taxes. In the preceding year earnings were $494,635. Net working capital of the company at the year end amounted to $4,171,408.

Interchemical Promotes Esposito and Morris

J. R. Esposito (left) and J. G. Morris, named vice-president of Interchemical Corp. and president of the Finishes Division, respectively.

Among the new products placed on the market during the past year are: natural vitamin A and vitamin D concentrates, in dry form, under the tradenames of Viadex and Nopdex; Dermolate, a cake form synthetic detergent; and several synthetic resin emulsions.

At present, pilot plant work on the production of sebacic acid and its esters is being completed and early commercial output is scheduled. The company is also field testing several dry detergents.

Market Aluminum Treating Composition

The Colonial Alloys Co., Philadelphia, is now marketing a compound, tradenamed Prepaint, for treating aluminum prior to painting or lacquering.

•It is claimed that the compound can be applied at room temperature, by dipping, spraying, or brushing, and reacts with the aluminum surface within a minute. It requires no venting, can be stored in ordinary steel containers, and is nonflammable. Correspondingly, there is said to be no scale build-up or deposits formed on tanks, racks, jigs, and so forth.

Aluminum parts with inserts, or attachments of other metals or plastics, can be so treated prior to immediate, or subsequent, painting. At present it is available in 55 gallon steel drums.

Centaur Extends Rahway Laboratories

Five-fold expansion of laboratory facilities at the Rahway plant of the Centaur Company Division is now nearing completion.

Latest addition is the expanded chemical control section. This brings to three the different laboratory divisions now maintained in Rahway under direction of Robert L. Herd, chief chemist. The other two are the bacteriological and research divisions.

Malmstrom Promotes New Lanolin

Developed some eight months ago, and distributed heretofore only in limited quantities, N. I. Malmstrom & Co., Inc., Brooklyn, is expanding marketing plans for its new "odorless" lanolin.

According to the company the new product, apart from being virtually odorless at ordinary temperatures, is also very light in color. Therefore it is particularly suitable for cosmetic cream formulations, and minimizes discoloration upon aging.

CHEMICAL MARKETS

Shellac Moving Into Tighter Position

Easing of Plastics Supply Foreseen

Fertilizer Prospects More Encouraging

More Stable Turpentine Market in Offing

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Shellac Shortage Looms

The shellac situation has long been one which has caused a good deal of concern, and unless conditions in India improve materially within the next few weeks a really serious shortage of the gum is expected to develop.

There have been a number of factors which have contributed to keep shellac on the short list. Not the least of these has been the high prices quoted by Indian suppliers, and the labor and political unrest which has swept that country. U. S. dealers have been loath to pay the prices asked by Indian exporters, for they have encountered price resistance among their own customers. Furthermore the shellac market is always speculative, and it is customarily inadvisable to carry huge inventories. Too, dock strikes, riots, and general political unrest have prevented the loading of ships; the shortage of freight cars has also slowed movement of the gum from the interior to Calcutta.

As a result no shipments were made from Calcutta during February, and U. S. stocks of shellac are at a low level. Even if consignments were to reach the U. S. soon it is doubtful if they would mean too much to spot purchasers, for many contractual obligations must be filled before much gum will be offered on the spot market.

The long-term future is difficult to foresee, but one fact is certain. A severe shortage of shellac looms unless marked, and unexpected, developments occur to improve the prospects.

Turpentine Market To Level Off

Few raw materials fluctuate as widely in price as does turpentine, and in the past few months particularly quotations have soared. But last month the market dipped, and in a few days bids dropped a full $9.50 per barrel.

Trade sources are divided as to the reason for the recession. Some maintain that it is a result of the inexorable functioning of the law of supply and demand, and that the turpentine market is now paying for the high asking prices of recent months. There is no doubt that consumer resistance had been built up, but what is more significant is the lack of confidence which consumers had in the market. Ever since turpentine reached $1.20 a gallon they have looked askance at the market, and have held back bids in anticipation of a decline. And such reticence has naturally contributed to shaded prices.

Other turpentine producers believe that the set-back is merely temporary. They feel that the unfavorable weather in major consuming markets (which has deferred exterior painting) has been the main depressing factor. They look to an increased spring demand, and a strengthening of prices.

There is much to support both views, but the odds favor the evolution of a more stabilized market. And indications are that prices will not approach former peaks in the foreseeable future.

Some Easing in Plastics

Although virtually all plastics are in short supply today indications are that there will be some easing of the stringent situation during the year, according to officials of the Plastics Materials Manufacturers Association.

It is anticipated that an improved supply status for molding materials will develop —particularly with respect to thermoplastics. A reasonable balance between supply and demand is now foreseeable. The outlook for thermosetting compounds is not as immediately promising.

The expansion program of plastic makers is running some three to six months behind schedule, but this has not caused a major delay in production. Much more serious have been the critical shortages in phenol, formaldehyde, urea, and phthalic anhydride. As a result the supply of phenolics and amino molding powders cannot be expected to increase more than ten per cent during the balance of 1947.

Contrary to this trend there is considerable justification for the belief that cellulosics, polystyrenes, acrylics, and several other thermoplastics will ease somewhat toward the end of the year or early in 1948.

Vinyl resins, although still short of total requirements, will be produced in greater volume during the last quarter.

The bottlenecks, however, will be in the limited availability of plasticizers. The shortage is expected to be of such magnitude that all vinyl output may not be fully utilized.

Fertilizer Components Ease Slightly

Although the output of nitrogen in the U. S. is gaining steadily the International Emergency Food Council holds that a critical world shortage of nitrogenous fertilizers will continue through 1947-1948. The actual shortage for the present year is said to be at least 761,000 tons of nitrogen.

However, in the U. S. alone, present plans call for the production of 475,000 tons of nitrogen for use in agriculture from five wartime plants which have been purchased recently by private concerns. Four of these are now operating; the fifth will be brought in within the near future. This output will represent 28 per cent more nitrogen than was used for agriculture in the U. S. A. and its possessions in the average (1935-39) prewar year. Indications are that production of nitrogen in the U. S. by 1948 will be double the amount consumed in the 1946-47 crop year.

World production of soluble phosphates is expected to be approximately in balance with world requirements in 1947-48, although some areas such as Germany may suffer from short supplies.

The potash prospects are less clear. Information is lacking on the probable supply for export from the Russian zone of occupied Germany and from Spain. If such exports should reach normal prewar levels during the coming fertilizer year world supplies would be sufficient to meet basic requirements. But it is a big "if."

Record Penicillin Production

The monthly rate of penicillin production more than doubled during 1946, according to the Civilian Production Administration.

Total production amounted to 25,808,570,000,000 Oxford units; military, 1,998,640,000,000 Oxford units; other government agencies, 407,580,000,000; civilian, 16,614,740,000,000; export, all forms, 12,155,000,000,000 and final allocation, 32,690,630,000,000.

Lead Begins Comeback

Lead output from domestic mines totalled 31,837 short tons in January, the largest monthly production recorded since January, 1946, and nearly 15 percent greater than the average monthly rate for 1946, according to the Bureau of Mines.

Advancing prices and a continued heavy demand for lead were largely responsible for the expanded domestic output in January. The month opened with lead at an all-time high of 12.55

cents per pound, New York, from which level it advanced to 13.00 cents on January 7 in order to meet increased quotations in the foreign markets. Early in January the United Kingdom advanced the lead price in the home market to £70 per long ton (approximately 12.6 cents per pound). Canadian lead prices were more than doubled, effective January 22, from 5 cents to 10.625 cents per pound.

Bauxite Output Gains

Domestic production of a third of a million tons of crude bauxite in the third quarter of 1946 was the greatest since the end of 1944 and exceeded that of any quarter prior to 1942, according to the Bureau of Mines. The output, partly estimated, was 341,079 long tons (289,917 tons dried equivalent) in the third quarter, a gain of 13 per cent over the 303,-163 tons (257,689 tons dried equivalent) produced in the second quarter.

Imports of bauxite in the third quarter were 260,754 long tons, 32 per cent greater than in the previous quarter. Almost all of it came from Surinam. Imports comprised 47 per cent of the new supply in the third quarter of 1946 compared with 20 per cent in 1942-44 and 54 per cent in 1925-41.

Record Rubber Consumption

Domestic consumption of synthetic and natural rubber last year topped the long-sought million ton mark by 34,190 long tons, according to the Rubber Manufacturers Association. This record figure represents a 29 per cent gain over 1945.

Consumption of natural rubber amounted to 277,562 long tons, 163.27% above the previous year. Usage of all types of synthetic rubber came to 756,628 long tons, nearly 10% over the 1945 level. Of this total, general purpose type synthetic (GR-S) usage amounted to 626,-960 long tons.

Reclaimed rubber consumption accounted for 275,497 of all rubber used.

Zinc Output Advances

The mine production of zinc in the United States in January reached the highest level since May 1945, according to the Bureau of Mines, United States Department of the Interior. The January output of 52,459 short tons was 11 percent greater than the average monthly rate for 1946.

New High For Tag Sales

Fertilizer tax tag sales in 16 States for July-February of the current fiscal year, based on reports of State control officials to The National Fertilizer Association, reached a new all-time high. Tag sales during this period, in equivalent tons, amounted to 5,996,000 short tons; this represents increases of 15.7 percent over 1946 and 30.7 percent over 1945.

SYNTHETIC ORGANIC CHEMICALS

U. S. Production, 1946
Preliminary estimate only

Acetic acid:	
Synthetic	284,826,200
Recovered	1,191,263,300
Natural[2]	27,363,800
Acetic anhydride[3]	521,978,400
Acetone	335,928,300
Acetylsalicylic acid	9,851,000
Aniline	8,913,000
Barbituric acid derivatives[4]	
5-Ethyl-5 phenylbarbituric acid and salts	392,000
Benzene	
Motor grades	
Tar distillers[5]	9,036,000
Coke-oven operators	29,707,000
Other grades	
Tar distillers	19,969,000
Coke-oven operators	107,829,000
Butyl alcohol	125,811,000
Carbon disulfide	302,544,000
Carbon tetrachloride	145,764,000
Chlorobenzene, mono	268,641,000
Creosote oil	
Tar distillers[5]	11,223,500
Coke-oven operators[6]	48,655,000
Cresols[7]	
Meta-para	5,494,000
Cresylic acid, refined[7,8]	23,466,000
DDT	44,579,000
Dyes	
C. I. 202 chrome blue black R	2,129,000
C. I. 581 direct black EW	10,551,000
C. I. 1114 Anthraquione vat blue BCS 20%	2,106,000
Ethyl acetate 85%	94,765,000
Ethyl ethers, tech and U. S. P.	39,923,000
Formaldehyde (37% by weight)	460,047,000
Lakes: Peacock blue	2,877,000
Methanol	
Natural[9]	15,686,000
Synthetic	491,633,000
Naphthalene	
Tar distillers:[5]	
Crude, solidifying at less than 79° C.	186,412,000
Refined, solidifying at 79° C. and over	95,564,000
Coke-oven operators[6]	
Crude, solidifying at less than 79° C.	70,907,000
Penicillin[4]	27,109,000
Phenol (synthetic and natural) tech. and U. S. P.[7]	219,137,000
Phtalic anhydride	307,741,000
Styrene (Gov. owned plants only)	374,862,000
Sulfathiazole	4,058,000
Toluene	
Coke-oven operators[6]	16,947,000
All other[8,10]	16,987,000
Vitamins	
Ergosterol, irradiated Quantity	31,359,000
Niacin and Niacinamide Quantity	940,000
Pyridoxine (B_6) Quantity	9,900
Thiamin chloride Quantity	179,000

[1] Reported on the basis of 100 percent content of the specified material unless otherwise indicated.
[2] Natural acetic acid (produced by direct process from wood) and acetic acid distilled from calcium acetate as reported to the U. S. Bureau of the Census.
[3] Produced from ketene, acetylene, ethylene, and from acetic acid by the vapor phase process.
[4] Statistics are given in terms of bulk medicinals only.
[5] Produced by tar distillers from purchased coal tar only or from oil-gas or water-gas tar produced or purchased by tar distillers.
[6] Product of byproduct coke-oven operators only. These statistics are collected and compiled by the Coal Economics Division, U. S. Bureau of Mines.
[7] Statistics represent total production, from all sources, including both data reported by coke-oven operators to the Coal Economics Division, Bureau of Mines and that reported by distillers of purchased coal tar to the U. S. Tariff Commission.
[8] Includes refined cresylic acid derived from petroleum.
[9] Reported to the U. S. Bureau of the Census.
[10] Includes toluene produced from petroleum by any process.
[11] Includes panthothenic acid and salts, riboflavin for animal use, irradiated animal sterols, menadiones, and other vitamins for which statistics are not shown.

Source: U. S. Tariff Commission.

PAINT, VARNISH, LACQUER, AND FILLER—1946

Total sales reported by 680 establishments		$796,464,916
Classified sales reported by 580 establishments		
Trade sales of paint, varnish and lacquer		423,507,322
Industrial sales, total		291,059,033
Paint and varnish	$215,944,779	
Lacquer	75,114,254	
Unclassified sales reported by 100 establishments		81,898,561

Metal Can Output Up

Metal can shipments to packers of all types of products totaled 2,759,519 tons in 1946 according to the U. S. Department of Commerce. This volume, second largest in can making history, was approximately 3% less than the volume for the peak year of 1941. It was higher than the 1945 output and 33% above 1944 totals.

The heaviest shipments occurred during the third quarter of 1946. In that period, the Pacific and Hawaii division (Washington, Oregon, California and Hawaii) supplied six times the number manufactured during the first quarter.

In all other quarters of the year the East North Central region (Ohio, Indiana, Illinois, Michigan and Wisconsin) was the most prolific producer. Peak month was August when 343,000 tons were shipped.

Insecticide Prospects Good

Despite the continuance of material and equipment shortages, the insecticide industry anticipates another peak sales year in 1947.

Requirements for DDT insecticides in the United States are reaching such proportions that it may be several years before the potential consumption can be fully appreciated. The total production of technical DDT from Sept. 1, 1945, to the end of 1945 was 13,600,000 pounds. The total production from Jan., 1946, through August, 1946, was 29,696,453 pounds, making the total production for the year beginning Sept., 1945, reach 43,296,453 pounds. Manufacture of DDT for use in insecticides by civilians did not begin until September, 1945.

Output in 1947 may be expected to increase further even though essential ingredients used in the compounding, such as chlorine may still be in short supply for a time.

Chemicals Wartime End-Use Distribution

The Bureau of Census, aided by the CPA, is compiling summaries of end-use data on chemicals collected and compiled by the WPB during the war, which will serve to supplement similar information released by the Chemicals Bureau in wartime. Basically, the series will be concerned with civilian end-uses.

The data are subject to several major limitations. First, the end-use patterns are indicative of wartime distribution, which usually differs markedly from peacetime distribution. Too, most of the releases are based on allocations, which vary indeterminately from actual consumption. The initial allocations summarized authorizations for the distribution of the material, and applicants were not obliged to take full allotments. Furthermore, production was sometimes interrupted, transportation difficulties inter-

fered with deliveries, and purchasers' use schedules were disarranged.

A third important limitation is that the ultimate end-use of chemicals allocated directly for military use is indeterminable, and the indicated end-use pattern is correspondingly distorted in cases where such allocations are large. Indirect military use, however, is included, since it was usually identifiable as such.

Nevertheless, although not of prime importance from the standpoint of statistical validity, and bearing in mind the limitations which affect interpretation, the Bureau submits the data as a reasonably accurate indication of wartime distribution.

NORMAL BUTYL ACETATE
July 1, 1944–June 30, 1945
(*Thousands of pounds*)

Use	Total *Amount*	*Percent*
Total Allocations	75,347	100.0
Export	9,309	12.4
Direct military[1]	7	[2]
Other uses	66,031	87.6
Protective coatings	63,467	84.2
De-icers	925	1.2
Cements and adhesives	617	0.8
Resins and plastics	201	0.3
Medicinals	133	0.2
Miscellaneous uses and small orders	688	0.9

[1] End-use data not available.
[2] Less than one-tenth of one percent.

COPPER SULFATE
January 1, 1944–June 30, 1945
(*Thousands of pounds $CuSO_5.5H_2O$*)

Use	Total *Amount*	*Percent*
Total Allocations	359,037	100.0
Direct military[1]	55	[2]
Export	121,382	33.8
Other uses	237,600	66.2
Agriculture	160,447	44.7
Mining-ore flotation	18,327	5.1
Mildew-proofing	8,692	2.4
Catalyst	6,156	1.7
Dyes and pigments	5,802	1.6
Water purification	5,330	1.5
Wire drawing	4,284	1.2
Pharmaceuticals	1,487	0.4
Gasoline sweetener	1,166	0.3
Electroplating	969	0.3
Wood preservatives	492	0.2
Miscellaneous uses and small orders	24,448	6.8

[1] End-use data not available.
[2] Less than one-tenth of one percent.

ANIMAL GLUE
July 1, 1944–June 30, 1945
(*Thousands of pounds*)

Use	Total *Amount*	*Percent*
Total Allocations	152,953	100.0
Export	1,868	1.2
Other uses	151,085	98.8
Gummed paper and tape	41,253	27.0
Adhesives	17,039	11.1
Abrasives	12,656	8.3
Paper and paper products	9,606	6.3
Textiles	7,347	4.8
Gaskets and cork products	5,838	3.8
Containers	5,216	3.4
Matches	4,298	2.8
Woodworking	3,601	2.4
Bookbinding	1,249	0.8
Printer rollers	1,242	0.8
Miscellaneous uses and small orders	41,740	27.3

CHROMIC ACID
(January 1, 1944 - December 31, 1944)
(*Thousands of pounds 100% CrO_3*)

Use	*Amount*	*Percent*
Total Allocations[1]	17,395	100.0
Export	174	1.0
Metal treatment	12,971	74.6
Chemical manufacture[1]	765	4.4
Corrosion prevention[2]	299	1.7
Miscellaneous uses and small orders	3,186	18.3

[1] Excludes chromic acid used in the manufacture of other primary chromium chemicals.
[2] Includes metal alloys.

ANHYDROUS AMMONIA

(January 1 - June 30, 1943 and January 1 - June 30, 1945)

(Short tons, 100% NH_3)

Use	Jan. 1 - June 30, 1945 Amount	Per-cent	Jan. 1 - June 30, 1943 Amount	Per-cent
Total Allocations	264,618	100.0	254,160	100.0
Export	4,561	1.7	2,815	1.1
Direct military[1]	43,790	16.6	25,784	10.1
Other Uses	216,267	81.7	225,561	88.8
Chemical manufacture	68,194	25.8	95,774	37.7
Agriculture	43,328	16.4	49,679	19.6
Explosives	31,700	11.9	23,875	9 4
Aqua ammonia	13,984	5.3	11,204	4.4
Plastics	15,597	5.9	4,061	1.6
Refrigeration	7,890	3.0	2,598	1.0
Miscellaneous uses and small orders	35,574	13.4	38,370	15.1

[1] End-use data not available.

SHELLAC

July 1–December 31, 1943

(Thousands of pounds)

Use	Total Amount	Percent
Total Allocations	*6,496*	*100.0*
Direct military[1]	5	0.1
Other uses	*6,401*	*99.9*
Phonographic records	1,394	21.5
Leather, textile, paper treatment	774	11.9
Bonding mica	772	11.9
Hat processing	609	9.4
Electrical parts and insulation	463	7.1
Abrasives	288	4.4
Inks, pencils, printing, and engraving	260	4.0
Motors, machines, and parts	227	3.5
Arms, weapons, and ammunition	223	3.4
Containers	184	2.8
Medicine, dentistry, and science	177	2.7
Telephone and radio equipment	168	2.6
Aviation parts and equipment	156	2.4
Vehicles and vessels	144	2.2
Cements and adhesives	136	2.1
Basing cement for tubes and bulbs	109	1.7
Patterns: wood, plaster, and metal	90	1.4
Rubber products	84	1.3
Furniture, mirrors, and refrigerators	71	1.1
Waxes: sealing and emulsion	31	0.5
Identification badges	22	0.3
Floor maintenance and repair	17	0.3
Miscellaneous uses and small orders	92	1.4

[1] End-use data not available.

COPPER OXIDES

January 1, 1944–June 30, 1945

(Thousands of pounds, 88% copper)

Use	Total Amount	Percent
Total Allocations	27,640	100.0
Direct military[1]	5,498	19.9
Export	106	0.4
Other uses	22,036	70.7
Anti-fouling paints	18,687	67.6
Dyes and pigments	544	2.0
Electroplating	732	2.6
Agriculture	504	1.8
Gasoline sweetener	360	1.3
Catalysts	326	1.2
Miscellaneous uses and small orders	883	3.2

[1] End-use data not available.

NAPHTHENIC ACID

July 1, 1944—June 30, 1945

(Thousands of pounds)

Use	Total Amount	Percent
Total Allocations	31,761	100.0
Export	2	[1]
Direct military[2]	7,220	22.7
Other uses	24,539	77.3
Fungicides and wood preservatives	15,619	49.2
Driers	4,911	15.5
High pressure lubricants	1,319	4.2
Rust preventatives	961	3.0
Ore flotation, solvation, and emulsification	804	2.5
Cutting oils	405	1.3
Metal cleaning and degreasing	161	0.5
Miscellaneous uses and small orders	359	1.1

[1] Less than one-tenth of one percent.
[2] End-use data not available.

CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
March, 1945, $0.871 *March, 1946, $0.847*
March, 1947, $0.624

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Acetaldehyde, 99%, drs.wks..lb.	.11	.15	.11	.15	.11	.14
Acetic Anhydride, drs.....lb.	.11½	.13	.11½	.13	.11½	.13
Acetone, tks, delv.....lb.	.07	.10	.07	.10	.06	.07
ACIDS						
Acetic, 28% bbls.....100 lbs.	3.78	4.03	3.38	4.03	3.38	3.63
Glacial, bbls.....100 lbs.	10.65	10.90	9.15	10.90	9.15	9.40
drs, wks.....100 lbs.	13.20	13.75	6.93	13.75	6.93	7.25
Acetylsalicylic, Standard USP.....lb.	.45	.59	.45	.59	.40	.59
Benzoic, tech, bbls.....lb.	.43	.47	.43	.47	.43	.47
USP, bbls., 4,000 lbs. up..lb.	....	.54	....	.54	....	.54
Boric tech, bbls, c-l.....tons *a*	....	137.50	....	137.50	....	109.00
Chlorosulfonic, drs, wks.....lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls.....lb. *b*	.20	.21	.20	.21	.20	.21
Cresylic 50%, 210-215° HB, drs, wks, frt, equal.....gal.	1.01	1.04	1.01	1.04	.81	1.04
Formic, 85%-90% cbys.....lb.	.12	.14½	.10	.14½	.10	.13
Hydrofluoric, 30% rubber, drs .....lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, lgt, bbls, wks..lb.	.039	.0415	.039	.0415	.039	.0415
44%, light, bbls, wks.....lb.	.073	.075	.073	.0755	.073	.0755
Maleic, Anhydride, drs.....lb.	.25	.26	.25	.26	.25	.26
Muriatic 18° cbys.....100 lbs.	1.50	2.90	1.50	2.90	1.50	2.45
20° cbys, c-l, wks....100 lbs.	....	2.00	....	2.00	....	1.75
22° cbys, c-l, wks. ...100 lbs.	....	2.50	....	2.50	....	6.00
Nitric, 36°, cbys, wks..100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	5.25
38°, c-l, cbys, wks...100 lbs. *c*	....	5.50	....	5.50	....	5.50
40°, c-l, cbys, wks...100 lbs. *c*	....	6.50	....	6.50	....	6.00
42°, c-l, cbys, wks...100 lbs. *c*	....	7.00	....	7.00	....	6.50
Oxalic, bbls, wks.....lb.	.13	.14	.11¾	.14	.11¼	.14½
Phosphoric, 100 lb. cbys, USP.....lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls.....lb.	.26	.42	.26	.42	.26	.42
Sulfuric, 60°, tks, wks.....ton	....	13.50	....	13.50	....	13.00
66°, tks, wks.....ton	....	17.50	....	17.50	....	16.50
Fuming 20% tks, wks....ton	....	20.50	....	20.50	....	19.50
Tartaric, USP, bbls.....lb.	.54½	.55	.54½	.55	.54½	.71
Alcohol, Amyl (from Pentane) tks, delv.....lb.	....	.151	....	.151	....	.131
Butyl, normal, syn, tks...lb.	....	.14½	....	.14½	....	.14½
Denatured, CD 14, c-l drs.....gal. *d*	....	.89½	....	.89½	....	.90
Denatured, SD, No. 1, tks. *d*	....	.82½	....	.82½	....	.82½
Ethyl, 190 proof tks.....gal.	....	17.94	....	17.94	....	17.94
Isobutyl, ref'd, drs.....lb.	....	.13	....	.13	....	.0860
Isopropyl ref'd, 91%, dms.....gal.	.47½	.50½	.41	.50½	.38	.47
Alum, ammonia, lump, bbls, wks.....100 lbs.	....	4.25	....	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks..lb.	....	.10¼	....	.10¼	.09	.12
Hydrate, light, bgs.....lb.	....	.14½	....	.14½	....	.14½
Sulfate, com'l. bgs, wks, c-l.....100 lbs.	1.15	1.30	1.15	1.30	1.15	1.25
Sulfate, iron-free, bgs, wks .....100 lbs.	1.95	2.50	1.75	2.50	1.75	2.00
Ammonia anyhd, cyl.....lb.	.16	.20	.14½	.20	....	.14½
Ammonia, anhyd, fert, tank cars, wks, frt. equalized...ton	....	59.00	....	59.00	....	59.00
Ammonium Carbonate, USP, lumps, drs.....lb.	.08¼	.09½	.08¼	.09½	.08¼	.09½
Chloride, whi, bbls, wks, 100lbs.	4.75	5.00	4.45	5.15	4.45	5.15
Nitrate, tech, bgs, wks....lb.	.0435	.0450	.0435	.0450	.0435	.0850
Oxalate pure, grn, bbls....lb.	...	.23	....	.23	....	.23
Perchlorate, kgs.....lb.	no stocks		no stocks		no stocks	
Phosphate, dibasic tech, bgs.....lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs.....lb.	....	.34	...	.34	....	.34
Sulfate, drs, bulk.....ton	....	30.00	....	30.00	28.20	30.00
Amyl Acetate (from pentane) tks, delv.....lb.	....	.21	...	.21	....	.181
Aniline, Oil, drs.....lb.	.12	.14	.12	.14	.11½	.13
Anthraquinone, sub, bbls....lb.	....	.70	...	.70	....	.70
Antimony Oxide, bgs.....lb.	.23	.26	.21	.26	.15	.21¾
Arsenic, whi, bbls, powd....lb.	.06	.08	.05	.08	.04	.05¾

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices. *a* Powdered boric acid $5 a ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Barium Carbonate precip, wks, bgs.....ton	67.50	82.00	60.00	82.00	60.00	75.00
Chloride, tech, cyst, bgs, zone 1.....ton	80.00	90.00	73.00	95.00	73.00	78.00
Barytes, floated, paper bgs..ton	....	41.95	....	41.95	....	41.95
Bauxite, bulk mines.....ton	8.50	10.00	7.00	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs.lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd.....gal.	....	.17	....	.17	....	.17
Benzyl Chloride, cbys.....lb.	.20½	.23	.20	.23	.20	.24
Beta-Naphthol, tech, bbls, wks.....lb.	.23	.25	.21	.25	.21	.24
Bismuth metal, ton lots.....lb.	....	2.00	....	2.00	1.25	1.80
Blanc Fixe, 66⅔% Pulp, bbls, wks.....ton *h*	55.00	60.00	40.00	60.00	40.00	46.50
Bleaching Powder, wks. 100 lbs.	2.75	3.75	2.50	3.75	2.50	3.60
Borax, tech, c-l, bgs.....ton *i*	48.50	51.00	45.00	51.00	....	45.00
Bordeaux Mixture, bgs.....lb.	.15	.23	.11	.23	.11	.11½
Bromine, cases.....lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm. drs....lb.	.26½	.27	.26	.27	.1860	.26½
Cadmium Metal.....lb.	1.75	1.80	....	1.80	.90	1.55
Calcium, Acetate, bgs..100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs.....ton	50.00	90.00	50.00	90.00	50.00	90.00
Carbonate, c-l bgs.....ton	18.00	22.00	18.00	22.00	18.00	22.00
Chloride, flake, bgs, c-l...ton	21.50	38.00	18.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l....ton	21.00	37.50	18.00	37.50	18.00	37.50
Cy'n'd, min. 21% N, c.l...lb.	.02¼	.02¾	.02¼	.02¾	....	....
Gluconate, USP, bbls.....lb.	.58	.65	.57	.65	.57	.59
Phosphate, tri, bbls, c-l...lb.	....	.0635	....	.0635	....	.0635
Camphor, USP, gran, powd, bbls.....lb.	.77	.79	.77	.82	.69	.82
Carbon Bisulfide, 55-gal. drs..lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl.....lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs.....lb.	.06	.06½	.06	.06½	69	.80
Casein, Acid Precip, bgs, 10,000 lbs. or more.....lb.	no prices		no prices		.24	.33
Chlorine, cyls, lcl, wks, contract.....lb.	....	.08¾	....	.08¾	....	.07¼
cyls, c-l, contract.....lb. *j*	....	.06¾	....	.06¾	....	.05¼
Liq. tk, wks, contract. 100 lbs.	....	2.30	....	2.30	....	2.30
Chloroform, tech, drs.....lb.	.20	.23	.20	.23	.20	.23
Coal tar, bbls, crude.....bbl.	8.25	9.50	8.25	9.50	8.25	9.00
Cobalt, Acetate, bbl.....lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs.....lb.	....	1.84	....	1.84	....	1.84
Copper, metal.....100 lbs.	....	21.50	....	21.50	12.00	14.75
Carbonate, 52-54%, bbls..lb.	.23	.24	.19½	.24	.19½	.20½
Sulfate, bgs, wks cryst.....100 lbs.	7.60	8.60	7.10	8.60	5.00	7.25
Copperas, bulk, c-l, wks....ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs.....lbs.	.13¾	.14¼	.13¾	.14¼	.10¾	.14¼
Dibutylamine, c-l, drs, wks..lb.	....	.76	....	.76	....	.6^
Dibutylphthalate, drs.....lb.	.29½	.31	.29	.31	.17	.29½
Diethylaniline, drs.....lb.	....	.48	....	.48	....	.48
Diethyleneglycol, drs, wks...lb.	.14	.15	.14	.15	.14	.15
Dimethylaniline, drs, cl., lcl..lb.	.21	.22	.20	.22	.21	.22
Dimethylphthalate, drs.....lb.	.20	.20½	.20	.20½	.20	.20½
Dinitrobenzene bbls.....lb.	....	.16	....	.16	....	.18
Dinitrochlorobenzene, dms...lb.	....	.14	....	.14	....	.14
Dinitrophenol, bbls.....lb.	....	.22	....	.22	....	.22
Dinitrotoluene, drs.....lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks.....lb.	.16	.20	.16	.20	.16	.20
Diphenylamine bbls.....lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs.....lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate, syn. 85-90% tks, frt. all'd.....lb.	....	.09½	....	.09½	....	.09½
Chloride, USP, bbls.....lb.	.20	.22	.18	.22	.18	.20
Ethylene Dichloride, lcl. wks, E. Rockies, drs.....lb.	.09	.0950	.0891	.0950	.0842	.0941
Gylcol, dms, cl.....lb.	....	.12	....	.12	....	.10
Fluorspar, No. 1, grd. 95-98% bulk, cl-mines.....ton	....	37.00	....	37.00	....	37.00
Formaldehyde, bbls, cl & lcl..lb.	.0595	.0645	.0520	.0645	.0520	.0570
Furfural tech, drs, c-l, wks...lb.	....	.13	....	.13	....	.13
Fusel Oil, ref'd, drs, dlvd....lb.	.26½	.27½	.18½	.27½	.18½	.19½
Glauber's Salt, Cryst, c-l, bgs, bbls, wks.....100 lbs.	1.25	1.75	1.05	1.75	1.05	1.45
Glycerine dynamite, drs, c-l..lb.	.55¼	.75¾	.55¼	.75¾	.17½	.55¼
Crude Saponification, 88% to refiners tks.....lbs.	.45	.60	.45	.60	....	.60

GUMS

Gum Arabic, amber sorts bgs.lb.	.14½	.15	.13¾	.15	.11¾	.14½
Benzoin, Sumatra, cs.....lb.	.85	.90	.85	1.00	.52	1.70
Copal, Congo.....lb.	no prices		.... no prices			.55¾
Copal, East India, chips....lb.	no prices		.... no prices			.55¾
Macassar dust.....lb.	no prices		.... no prices			.07¾
Copal Manila.....lb.	no prices		.25	....	.13½	.25
Copal Pontianak.....lb.	no prices		.... no prices			.17½
Karaya, bbls, bxs, drs.....lb.	.21	.50	.21	.50	.18	.50

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

Current Prices

Gums
Salt Cake

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Kauri, N. Y.						
Superior Pale XXX ..... lb.	no prices		....	nom.	....	.65¾
No. 3 ..... lb.	no prices		....	nom.	....	.22
Sandarac, bgs ..... lb.	.90	.95	.90	.95	.90	.99½
Tragacanth, No. 1, cases .... lb.	4.50	5.00	5.00	5.25	3.75	5.25
No. 3 ..... lb.	3.20	3.45	3.20	3.45	2.10	3.45
Yacca, bgs ..... lb.	no prices		....	nom.	.05	.07¼
Hydrogen Peroxide, cbys .... lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars .... lb.	....	2.10	....	2.10	1.75	2.10
Lead Acetate, cryst, bbls .... lb.	....	.19¼	....	.19¼	....	.16¾
Arsenate basic, bg, lcl ..... lb.	.21	.22	....	.22	.12	.18
Nitrate, bbls ..... lb.	.17¾	.18	....	.18	....	.12½
Red, dry, 95% Pb_3O_4 bbls ..... lb.	.17½	.19¼	.14¼	.19¼	.09	.16
97% Pb_3O_4, bbls delv ... lb.	.18	.19½	.15	.19½	.09½	.16¾
98% Pb_3O_4, bbls delv ... lb.	.18	.19¾	.15¼	.19¾	.08¼	.17
White, bbls ..... lb.	.15¾	.16¼	.13	.17¾	.07¼	.14¼
Basic sulfate, bbls, lcl ... lb.	.14½	.14¾	.12½	.14¾	.07¼	.13¼
Lime, Chem., wks, bulk ..... ton	6.50	9.00	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks ..... ton	8.50	12.00	8.50	12.00	8.50	12.00
Litharge, coml, delv. bbls .... lb.	.16¼	.17½	.13	.17½	.08	.15¼
Lithopone, ordi., bgs ..... lb.	.05½	.06	.03	.06	.04¼	.05¼
Magnesium Carb, tech, wks. lb.	.07¼	.10¼	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks c-l ..... ton	....	37.00	....	37.00	....	32.00
Manganese Chloride, Anhyd. bbls ..... lb.	.14	.16	.14	.16	.14	.18
Dioxide, Caucasian bgs, lcl ..... ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, drs .. gal. *l*	.63	.73	.63	.73	.63	.73
Synth, drs cl ..... gal. *m*	.31	.38	.31	.38	.24	.38
Methyl Acetate, tech tks .... lb.	.06	.07	.06	.07	.06	.07
C.P. 97-99%, tks, delv .. lb.	.09½	.10½	.09½	.10½	.09½	110½
Chloride, cyl ..... lb.	.33	.41	.32	.41	.32	.40
Ethyl Ketone, tks, frt all'd. lb.	....	.09	....	.09	....	.09
Naphtha, Solvent, tks ..... gal.	....	.23	....	.23	....	.27
Naphthalene, crude, 74°, wks, tks ..... lb.	....	.083	....	.083	.0275	.035
Nickel Salt, bbls, NY ..... lb.	.14	.14½	.14	.14½	.13	.14½
Nitre Cake, blk ..... ton	20.00	24.00	....	24.00	....	16.00
Nitrobenzene, drs, wks ..... lb.	.08	.09	.08	.09	.08	.09
Orthoanisidine, bbls ..... lb.	....	.70	....	.70	....	.70
Orthochlorophenol, drs ..... lb.	.25	.27	.25	.27	.25	.27
Orthodichlorobenzene, drs.. lb.	.07½	.08	.07	.08	.07	.08
Orthonitrochlorobenzene, wks ..... lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs. lb.	.08	.09	.08	.09	....	.09
Paraldehyde, 98%, wks lcl ... lb.	....	.13	....	.13	....	.12
Chlorophenol, drs ..... lb.	.24	.27	.24	.27	.24	.27
Dichlorobenzene, wks ..... lb.	.12½	.14	.12½	.14	.11	.17
Formaldehyde, drs, wks ... lb.	....	.22	....	.22	.21	.22
Nitroaniline, wks, kgs ..... lb.	.41	.43	.41	.43	.41	.45
Nitrochlorobenzene, wks. lb.	....	.15	....	.18	....	.18
Toluenesulfonamide, bbls. lb.	....	.70	....	.70	....	.70
Toluidine, bbls, wks ..... lb.	....	.44	....	.44	....	.48
Penicillin, ampules per 100,000 units	....	.21	....	.38	.38	.95
Pentaerythritol, tech ..... lb.	.32	.36	.27	.36	.27	.31

PETROLEUM SOLVENTS AND DILUENTS

Lacquer diluents, tks, East Coast ..... gal.	....	.12½	....	.12½	.11½	.12½
Naphtha, East tks, wks ..... gal.	....	.11	....	.11	.11	.12
Rubber solvents, East, tks, wks ..... gal.	....	.12	....	.12	.11	.12
Stoddard Solvents, East, tks, wks ..... gal.	....	.12	....	.12	.10	.12

Phenol, U.S.P., drs ..... lb.	.11¼	.13¼	.11¼	.13¼	.10½	.13¼
Phthalic Anhydride, cl and lcl, wks ..... lb.	.14½	.15½	.14½	.15½	.13	.15½
Potash, Caustics, 88-92%, wks, sol ..... lb.	.06¾	.07½	.06¼	.07½	.06¼	.06¾
Flake, 88-92% ..... lb.	.07½	.08	.07	.08	.07	.07½
liquid, 45% basis, tks ... lb.	....	.03⅛	....	.03⅛	....	.02⅞
drs, wks ..... lb.	.03¼	.04	.03¼	.04	.03	.03½
Carbonate, hydrated 83-85%, bbls ..... lb.	....	.05¾	....	.05¾	....	.05½
Chlorate crys, kgs, wks ... lb.	.11	.13	.11	.13	.11	.13
Chloride, crys, tech, bgs, kgs ..... lb.	.08	nom.	.08	nom.	.08	nom.
Cyanide, drs, wks ..... lb.	....	.55	....	.55	....	.55
Iodide, drs ..... lb.	1.75	1.78	1.44	1.78	1.44	1.48
Muriate dom, 60-62-63% K_2O bulk unit-ton .... unit	....	.40	....	.53½	.53½	.56½
Permanganate, USP, wks drs ..... lb.	.22½	.23	.20½	.23	.20½	.21
Sulfate, 90%, basis, bgs .. ton	36.25	39.25	36.25	39.25	36.25	39.25
Propane, group 3, tks ..... gal.	....	.03¾	....	.03¾	....	.03¾
Pyridine, ref., drs ..... lb.	.55	.55½	.55	.55½	.45	.55
R Salt, 250 lb. bbls, wks .... lb.	....	.72	....	.72	....	.65
Resorcinol, tech, drs, wks ... lb.	....	.68	.64	.74	.64	.74
Rochelle Salt, cryst ..... lb.	.34½	.35	.34½	.35	.34½	.47
Salt Cake, dom, blk wks .... ton	20.00	26.00	....	26.00	....	15.00
Saltpeter, grn. bbls ..... 100 lbs.	9.00	9.50	8.20	9.50	8.20	9.00

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

		Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Shellac, blchd. bone dry, bbls.	lb.	.71	.74½	.71	.74½	.42½	.74½
Silver Nitrate, bots, 2,500-oz. lots	oz.	.54⅞	.55⅝	.53¾	.59	.47	.59
Soda Ash, 58% dense, bgs, c-l, wks.	100 lbs.	....	1.28	....	1.28	....	1.28
58% light, bgs cl.	100 lbs.	....	1.20	....	1.20	1.05	1.20
Caustic, 76% flake drs, cl.	100 lbs.	2.90	3.00	2.90	3.00	....	3.00
76% solid, drs, cl.	100 lbs.	2.50	2.75	2.50	2.75	....	2.75
Liquid, 47-49%, sellers, tks.	100 lbs.	....	2.10	....	2.10	....	2.10
Sodium Acetate, anhyd. drs.	lb.	.08½	.10	.08½	.10	.08½	.10
Benzoate, USP drs.	lb.	.46	.52	.46	.52	.46	.52
Bicarb, USP, gran., bgs., cl., works.	100 lbs.	2.25	2.59	2.25	2.59	1.55	2.59
Bichromate, bgs, wks l.c.l.	lb.	.08⅜	.08⅞	.07⅞	.08⅜	.07⅞	.08⅜
Bisulfate powd, bbls, wks.	100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls., wks.	100 lbs.	1.40	1.65	1.40	1.65	1.40	1.65
Chlorate, kgs, wks c.l.	lb.	....	.06½	....	.06½	....	.06¾
Cyanide, 96-98%, drs.	lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, drs.	lb.	.07¼	.08¼	.07¼	.08¼	.07¼	.08¼
Hyposulfite, cryst, bgs, cl, wks.	100 lbs.	....	2.25	....	2.25	....	2.25
Metasilicate, gran, bbl, wks c-l.	100 lbs.	....	3.40	....	3.40	....	3.40
Nitrate, imp, bgs.	ton	....	41.50	....	41.50	33.00	38.50
Nitrite, 96-98% bbl. cl.	lb.	....	.06¾	....	.06¾	....	.06¾
Phosphate, dianhyd. bgs, wks.	100 lbs.	6.25	7.00	6.00	7.00	6.00	6.75
Tri-bgs, cryst, wks.	100 lbs.	3.50	3.90	2.70	3.90	2.70	3.10
Prussiate, yel. bbls, wks.	lb.	....	.12¼	....	.12¼	....	.11
Silicate, 52°, drs, wks.	100 lbs.	1.55	2.00	1.40	2.00	1.40	1.80
40°, drs, wks, c-l.	100 lbs.	.95	1.15	....	1.15	....	.80
Silicofluoride, bbls, NY.	lb.	.07½	.08½	.06½	.08½	.06½	.10
Sulfate tech, Anhyd, bgs.	100 lbs.	1.70	2.20	1.70	2.20	1.70	2.20
Sulfide, cryst c-l, bbls, wks.	100 lbs.	....	2.90	....	2.90	....	2.40
Solid, bbls, wks.	lb.	3.05	4.50	3.05	4.50	3.15	3.90
Starch, Corn, Pearl, bgs.	100 lbs.	4.02	4.62	....	4.62	4.321	6.271
Potato, bgs, cl.	lb.	.07¾	.08½	.0735	.08½	.0735	.0760
Rice, bgs.	lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs.	lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines.	ton	....	16.00	....	16.00	.. .	16.00
Flour, USP, precp, bbls, kgs.	lb.	.18	.36	.18	.36	.18	.36
Roll, bbls.	100 lbs.	2.65	3.40	2.65	3.40	2.40	3.40
Sulfur Dioxide, liquid, cyl.	lb.	....	.085	.07	.085	.07	.08
tks, wks.	lb.	....	.044	....	.044	....	.04
Talc, crude, c-l, NY.	ton	....	15.00	....	15.50	....	15.50
Ref'd, c-l, NY.	ton	....	17.50	....	17.50	13.00	21.00
Tin, crystals, bbls, wks.	lb.	....	.48	....	.48	no stocks	
Metal.	lb.	....	.70	....	.70	....	.70
Toluol, drs, wks.	gal.	....	.28	....	.28	.27	.32
tks, frt all'd.	gal.	....	.23	....	.23	.22	.27
Tributyl Phosphate, drs, lcl, frt all'd.	lb.	....	.65	....	.65	....	.65
Trichloroethylene, drs, wks.	lb.	.08	.09	.08	.09	.08	.09
Tricresyl phosphate tks.	lb.	....	.32	....	.32	....	.32
Triethylene glycol, drs.	lb.	.18½	.19½	.18½	.19½	.18½	.19½
Triphenyl Phos., bbls.	lb.	.26	.27	.26	.32	.26	.32
Urea, pure, cases.	lb.	....	.12	....	.12	....	.12
Wax, Bayberry, bgs.	lb.	no stocks		no stocks		no stocks	
Bees, bleached, cakes.	lb.	.70	.71	.68	.71	.60	.70
Candelilla, bgs, crude.	lb.	.76	.77	.77	.80	.62	.86
Carnauba No. 1, yellow, bgs, ton.	lb.	1.82	1.84	1.90	2.00	1.80	2.04
Xylol, Indus., frt all'd, tks, wks.	gal.	....	.23	....	.23	....	.26
Zinc Chloride tech, fusec wks.	lb.	.05	.0535	.05	.0535	.05	.0535
Oxide, Amer., bgs, wk.	lb.	.095	.0975	.09	.09¾	.07	.09¼
Sulfate, crys, bgs.	100 lbs.	4.15	4.90	3.40	4.90	3.40	4.15

OILS AND FATS

Babassu, tks.	lb.	no prices		no prices		.11	.12
Castor, No. 3, drs, c.l.	lb.	.33¼	.34¾	....	.34¾	....	.29¾
China Wood, drs, spot NY.	lb.	.39	.40½	.39½	.41	.39	.41
Coconut, edible, drs NY.	lb.	no prices		no prices		....	.0985
Cod, USP, bbls, drs.	gal.	2.60	3.70	2.60	3.80	2.15	3.80
Corn, crude, tks, wks.	lb.	.36½	.37	.27	.37	....	.27
Linseed ,Raw, drs, c.l.	lb.	.3950	.3960	.3580	.3960	.1680	.3640
Menhaden, crude tks.		.18½	nom.	.18½	nom.	.1220	.21½
Light, pressed, drs l.c.l.	lb.	....	.29	....	.29	.1300	.29
Palm, Niger, dms.	lb.	no prices		no prices		....	.0865
Peanut, crude, tks, f.o.b. wks.	lb.	.37	nom.	.28	.37	.12⅞	.28½
Perilla, crude, dms, NY.	lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks.	lb.	.32	nom.	....no prices		....	.13
Red, dms.	lb.	.31¼	.32¼	.29¾	.32¼	.13¾	.30¾
Soy Bean, crude, tks, wks.	lb.	....	.33	.26½	.33	.1175	.2450
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2 New, stainless Chemi-Colloid, 30 HP and 50 HP motors.
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1 Premier, type "C", 5" roter-stator, 3 HP motor.
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1 Manton-Gaulin, 600 GPH homogenizer.

STILLS

4 Distillation or fractionating columns, copper or steel, 18" to 62" diameter.

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1 Apron type single pass conveyor dryer, 18" x 23', motorized.
1 Double drum dryer, Black and Clawson, 30" x 60" with accessories.
1 Christie dryer, 70" x 40' long.
1 Proctor and Schwartz, steam heated, tray dryer, capacity—80 trays, 10" x 5" complete with accessories.
7 Rotary dryers, from 3' x 30' to 6' x 64'.
3 Single drum dryers, or flakers, 4' x 9', 4' x 12', and 3' x 6' with accessories.
1 Devine rotary vacuum dryer, 5' x 33', with 35 HP motor and accessories.
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1 Blaw Knox triple effect evaporator, horizontal type, 6' x 9', all steel.
3 Buffalo triple effect evaporator, 600 to 1200 sq. ft.
1 10' copper vacuum pan, calandria type.
1 Swenson single effect cast aluminum.
1 Zaremba cast iron single effect. 10' diameter x 12' high, 200 gallon holding capacity, copper tubes, complete with vacuum pump and condenser.
1 Pfaudler 60" Glass Lined Jacketed Evaporating pan newly rebuilt.

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New stainless kettles all sizes; prompt shipment.

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6 Mikro pulverizers, No. 1 and No. 2.
25 Fitzpatrick, stainless, model "D" comminuting machines.
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2 Jay Bee, No. 12 mills.
1 Lehman, 5 roll finisher or roller mill, 18" x 48".
2 Fuller mills, No. 33, 600 HP motor.
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12 Ointment, drugs, paste and color mills; Day, Hance, Ross, Waterville, etc.
5 Allis Chalmers and Stearns Rogers tube mills, 5' x 22'.
2 Rod mills, 5' x 10', 6' x 14'.
4 Hardinge mills, 2' x 4'6", 3' x 3'6", 5' x 22", others.
1 Porter jacketed mill, 5' x 5'.
3 Jar mills, single jar, 16½ x 20; multiple, 3 (2 gallons).
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2 Patterson horizontal double ribbon, 30" x 40" x 84".
2 Heavy duty, jacketed, 9 gallon, double arm, double gear.
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2 Brightwood and Redington Box Formers or Cartoners.
2 Compression Belts or Sealers; 8' and 12' long.
1 Ferguson Aut. Carton Gluer and Sealer.

PRESSES

2 Dunning & Boschert, 200 ton, curb presses, 28" ram, 28" stroke, steam platen.
3 Elmes hydraulic presses; 10" x 14", with pump and accumulator.
Elmes compression presses; 10" x 14", with pump and ton, 22 x 30 to 30 x 73.
1 Farrel, 130 ton, heated platen, 20" x 20" and 1—150 ton, 26" x 26".
2 Hardinge hydraulic presses, 24" x 28" platens, 14" ram, 9" stroke.
1 Rennebura, 5 ton screw press and dryer, 50 HP motor.
2 Southwark hydraulic presses, 80 ton, 20 x 20 and 100 ton, 36 x 36, with heated platen and accumulator.
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Write Box 4005, Chemical Industries, 522 Fifth Ave., New York 18, N. Y., giving information including age, experience, etc.

Chemist or Chemical Engineer

Experienced in the production and formulating of phenolic molding compounds. Position of responsibility located Middle West. State qualifications. Address Box 4010, Chemical Industries, 522 Fifth Ave., New York 18, N. Y.

CHEMICAL ENGINEERS and Chemists (all Branches) attractive positions available through Chemical Department, Position Securing Bureau (Agency), 45 John Street, New York.

CHEMIST, paint and varnish, to take complete charge of technical service laboratory of synthetic resin manufacturer. Wide experience necessary for full responsibility. Write complete qualifications. All replies held in strict confidence. American Alkyd Industries, Carlstadt, N. J.

CHEMIST, opportunity in expanding organization for chemist with wide experience for development and research on all types of synthetic resins. Write complete qualifications. All replies held in strict confidence. American Alkyd Industries, Carlstadt, N. J.

CHEMIST—Paint and Varnish manufacturing experience doing control work, formulating, research, specifications, etc. $6,000.00 a year to start plus bonus. Albrite Paint & Varnish Company, 8410 Amelia St., Oakland, California.

WANTED—On a consulting, or other, basis—chemist or chemical engineer experienced in producing methylamines commercially. Box 4018, Chemical Industries, 522 Fifth Avenue, New York 18, N. Y.

CHEMIST, recent graduate of recognized paint and varnish school or university, no experience required. Synthetic resin research and development work. Write complete qualifications. All replies held in strict confidence. American Alkyd Industries, Carlstadt, N. J.

WANTED

Chemical Purchasing agent well-connected, thoroughly experienced, references, mutual profit basis.

BOX 4025, CHEMICAL INDUSTRIES
522 Fifth Ave., New York 18, N. Y.

SITUATIONS WANTED

FOR CHEMISTS, Chemical and Metallurgical Engineers, write Chemical Department, Position Securing Bureau (Agency), 45 John Street, New York. Telephone COrtland 7-9650.

CHEMICAL ENGINEER

Broad experience during seventeen years of design, development and research work in diversified industries. Good background in chemistry, economics and directing research. Doctor's degree in engineering. Desires position in engineering, development or research requiring responsibility, imagination and initiative.

BOX 4020, CHEMICAL INDUSTRIES
522 Fifth Ave., New York 18, N. Y.

RESEARCH EXECUTIVE: Ph. D. 36. Wide experience inorganic products and processes, extractive metallurgy, mineral raw materials, development, promotion, sales. Will also consider consultant position advising on proposed processes, markets, or research programs. Box 4019, Chemical Industries, 522 Fifth Ave., New York 18, N. Y.

EMULSIONS AND PLASTICS CHEMIST: 19 years' experience in developing and supervision of production of surface coatings and adhesives including emulsion paint, resin emulsions, wax emulsions and polishes, ethyl cellulose lacquer emulsions and specialty items. Seeks responsible position with progressive organization. Box 4021, Chemical Industries, 522 Fifth Ave., New York 18, N. Y.

WANTED

General Purchasing Agent by large mid-western company. Experience in chemicals used in plastics and synthetics essential. Must be acquainted with producers and resourceful in obtaining materials. Excellent opening for a top flight man seeking opportuity for advancement. Address Box 4022, Chemical Industries, 522 Fifth Avenue, New York 18, N. Y.

WAGE RATES

(*Continued from page 598*)

with formal sick leave plans was slightly smaller for office than for plant workers, although the period of sick leave was more liberal for office employees. Sick leave for plant workers was reported by about one-seventh of the establishments and by one-eighth for office workers. Most plans granted plant workers one week's leave after a year of service, while others ranged from a few days to more than a month. Plans for office workers tended to be more liberal, with the majority providing two or more weeks leave.

Nearly three-fourths of all industrial chemical establishments studied contributed in whole or in part to one or more insurance or pension systems for their workers. An unusually large number of establishments reported retirement pension plans, although, as in other industries, life and health insurance plans were more common.

Packaging & Shipping

(*Continued from page 660*)

(Cancel) * 20 gauge authorized for containers not of the full open head type.
(Add) * 20 gauge authorized.

Superseding and amending par. 9(c), Spec 17E *(Closures)*, order Aug. 16, 1940, to read as follows:

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16 inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. *Provided, that for containers having a capacity of 12 gallons and less the seat (flange, etc.) for plug, or cap, must have two or more complete threads and plug, or cap, must have sufficient length of thread to engage two threads when screwed home with gasket in place.*

The reason for this amendment is that removable head containers provided under this Specification are now covered by a new Specification 17H and also due to manufacturing conditions for drums within these sizes, it is not possible to form closing parts as presently required.

A new Specification, ICC 42E, Aluminum Drums, has been approved by the Commission. This Specification reads as follows:

Amending order Aug. 16, 1940, as follows:
(Add)

Specification 42E

Aluminum Drums, Single-trip Container

Container must comply with Specification 42B except as follows (paragraph references are to specification 42B):

2. Rated capacity—as marked, see paragraph 9.—55 gallons; actual capacity shall be rated capacity plus at least 2 percent.
3. Composition.—Body and heads of aluminum alloy 52S. Plastic closure plugs authorized if suitably resistant to action of lading.
6. (a) Parts and dimensions.—To be of 14 B&S gauge (.064").
6. (b) Rolled or swedged in rolling hoops required.
7. (a) Closures. — Of screw-thread type or secured by screw-thread device; openings over 2.3 inches not authorized; suitable gaskets required; head openings only permitted. Vented closing devices of type approved by the Bureau of Explosives are authorized when specified by the purchaser.
8. Head rings.—Must be of 14 B&S gauge (.064") tack-welded to each head.
9. (a) ICC-42E.—This mark shall be understood to certify that the container complies with all specification requirements. The letters STC; located just below or above the ICC mark to indicate "single-trip container."
10. Size of marking (minimum)—1 inch high.
12. Leakage test. — Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 10 pounds per square inch. Leakers shall be rejected or repaired and retested.

Specifications for marking water capacities in pounds on ICC 105A300, 104A, 104A-W, 105A300-W, 105A400-W, 105A-500-W, 105A600-W, have been amended, and it is suggested that these amendments be consulted for discussion in marking these capacities on these types of tank cars.

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INDEX *of* ADVERTISERS

"WE"— EDITORIALLY SPEAKING

SHURE, AND THE DAY we wrote this (March 17) was a great day for the Irish here in New York. We finished with lunch about 1 and finally fought our way back to the office by 2:15. Fifth Avenue, meanwhile, was one huge slab of Blarney stone, as 100,000 sons and daughters of the enchanted isle parade past St. Pat's Cathedral. This is a foine time to greet the Rileys, O'Sullivans and Murphys among our readers.

WITH SPRING already with us, the time has now come for us to make a grim decision: Will we have a garden this year, or will we follow the easy route—sow it with grass seed and stake out a couple of sheep to keep it cropped?

For years now we have endured much, gardenwise. Day after day we crawl to the office—grimy, sun-burned, and lame-backed. We have a terrific arsenal of insecticides—specifics for corn ear worm, onion thrips, squash bugs, and what not. Yet we always lose the battle. They devour our roses, riddle our radishes, and perforate our cabbage.

So we have been vacillating in our thoughts, and had just about decided to forget the battle this year and enjoy a hammock-summer. But today we thumbed through a seed catalog—raspberry canes, apple trees, and zinnias as big as your hat. It stirred us not one whit. But on page 72 there was a caption, "Grow your own shortcake," coupled with a drooly picture. That did it. Now all we have to worry about is what to do about the ants which *always* eat our strawberries.

THE DAY AFTER we sat up in the darkest hours before dawn preparing Form 1040 for Uncle Sam's revenooers we received a similar jolly form from New York State. To those of you who had to fill out mile after mile of sextuplicate data on this, that and the other for the WPB, OPA, and XYZ, we say "Brother, anarchy is simpler!"

A DEFINITION of glass, contrived by a *"Member of American Chemical Society,"* who is identified no further, is quoted in the *New York Times Magazine:*

> Glass—"An inorganic substance in a condition which is continuous with and analogous to the liquid state of that substance, but which, as the result of having been cooled from a fused condition, has attained so high a degree of viscosity as to be for all practical purposes rigid."

Now do you see what an editor is up against! What it says in simple language is, "If you hit it, it busts."

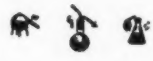
ST. PATRICK'S DAY we had the pleasure of meeting Charlie Sweeney, Monsanto's new public relations representative here in New York. His name is Sweeney. He comes from Boston. We sadly report that he was wearing a *red* tie. Tsk! Tsk! Tsk!

MERCK & Co. takes justifiable pride in the confidence displayed in them by a South American woman whose letter they quote in the March *Merck Review:*

> My husband has used your chemicals for many years. Through a great error, he now is in jail. Please send funds to help appeal his case so he can use your chemicals again.

A COUPLE OF MONTHS AGO we mentioned one of the humbler uses of the lowly, rough-and-ready corn cob. In the feature section of this issue you'll learn, as we did, that nylon now stems from this material.

Too bad there aren't any furfural-yielding pentosans in a sow's ear, or Du Pont chemists could duplicate Arthur D. Little's stunt of making a silk purse thereof.



TVA, WE LEARN from the *New York Herald Tribune,* has developed a fertilizer containing 48 per cent *potassium pentoxide.* That must be, if our fading memory of freshman chemistry is at all to be depended upon, the anhydride of potassic acid. Potassium potassate (Ah! It's coming back to us now!) is then KKO_3. Good stuff, we recall, for onion thrips.

THINGS ARE TOUGH all over. The CPA lists a "Southern Alcoholic Corp." in Corpus Christi, the executives of which, we presume, indulge in wild bacchic revels every night, and the *Journal of Commerce* reports that a Dutch unit of the Shell group is "trembling production of its fertilizer factory."

Yes, these are time that make us tremble!

FIFTEEN YEARS AGO

(From Our Files of April, 1932)

Announcement was made March 9 of the completion of an agreement between the Dyestuffs Cartel and Imperial Chemical Industries Ltd. Says Francis P. Garvan, president of the Chemical Foundation, "This combination makes the disarmament talk nonsense. Chemistry is the main armament today. This means a military alliance of the whole world against America."

Representative Hamilton Fish (N.Y.) is concerned about the exportation of nitrates to Japan, who, he claims, will use them to make explosives for war against the Chinese.

International Combustion Tar & Chemical Corp., one of the largest coal tar concerns in the world, is sold to P. C. Reilly, president of the Republic Creosoting Co., of Indianapolis. The deal is personal and does not involve the latter firm.

Atlas Powder Co. acquires entire assets of Peerless-Union Explosives.

Du Pont announces "Dulux White," a new exterior finish . . . Michigan Alkali will produce 150 tons per day of solid carbon dioxide at Wyandotte, Mich . . . George Eastman commits suicide.

THIRTY YEARS AGO

(From Our Files of April, 1917)

Dr. William Beckers is working out plans for the $20,000,000 amalgamation of Wm. Beckers Aniline, Schoellkopf Aniline and Chemical, National Aniline, Standard Aniline, and Benzol Products.

Spencer Kellogg & Sons complete a plant at Edgewater, N. J., for crushing copra.

California Alkali Co. has been organized to construct works at the southern end of Owens Lake to manufacture soda ash and other products from the lake waters.

E. C. Klipstein & Sons Co. increase capital from $100,000 to $1,000,000 for expansion purposes.

Franklin K. Lane, secretary of the Interior, says that the government will need 6,000,000 tons of sulfuric acid this year.

Du Pont buys new nitrate fields in Chile which will produce 100,000,000 pounds per year.

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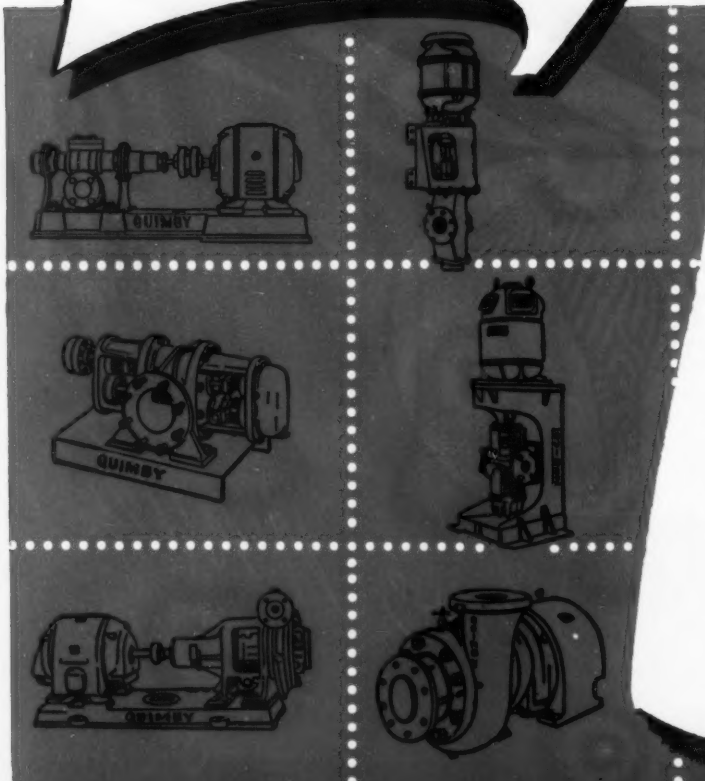

Yes, we outgrew two plants in New Jersey! Your orders for QUIMBY Screw, Rotex, and Centrifugal Pumps swamped our facilities at both plants and we were forced to seek larger quarters. Now, with all our manufacturing facilities centralized in one plant, with modernized equipment, increased capacity, and a larger engineering staff we are in better position than ever before to maintain the leadership we have held for 50 years.

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Abstracts of U. S. and Foreign Patents

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

Requests for further information or photostated copies of Canadian patents should be addressed to the Commissioner of Patents and Copyrights, Department Secretary of State, Ottawa, Canada.

U. S. Patents from Official Gazette—Vol. 593, Nos. 3, 4, 5—Vol. 594, No. 1. (December 17-January 7)
Canadian Patents Granted and Published January 28—February 18, 1947.

*Processes and Methods

Apparatus for regulating venting of effluent through conduit extending from processing containing evolving normally gaseous effluent, means for discriminating between gaseous and liquid phases of effluent in conduit, control means sensitive to discriminatory means in response to presence of liquid phase in effluent, etc. No. 2,411,986. Robert Cowherd to The Bristol Co.

Casting flowable material into permanent mold consisting in steps of forcing material under pressure from pressure chamber of given cross-sectional area through constricted passageway of smaller cross-sectional area into mold in amount sufficient to fill mold and passageway, as incipient solidification of material in mold occurs, contracting length of passageway under application of greatly increased pressure, forcing additional amount of material from passageway into mold. No. 2,411,999. Nathan Lester to Lester Engineering Co.

Conversion process comprises endothermically reacting fluid reactant in presence of subdivided solid catalyst in reaction zone, simultaneously exothermically regenerating solid catalyst in regenerating zone, maintaining relatively dense catalyst bed in each of zones, etc. No. 2,412,025. Gordon Zimmerman to Universal Oil Produts Co.

Sintering which includes steps of moving sintering material having low moisture content forwardly in form of stream, depositing on moving stream thin, relatively narrow ribbon of iron bearing material having small cross-sectional area and high moisture content and thereby transfering some of moisture of high moisture material to low moisture materials, etc. No. 2,412,104. William Stewart to Republic Steel Corp.

Contacting finely divided solid particles successively with two fluids comprises maintaining two solid particle fluid contacting zones in vertical alignment and partitioned from each other, continuously passing solid particles vertically downward in annular column from lower portion of lower contacting zone, reversing direction of flow of solid particles by admixing them with vertically upward flowing stream of fluid to be contacted in upper contacting zone, passing resultant mixture upwardly in straight line flow in confined path extending vertically through annular column and lower zone, etc. No. 2,412,152. Lyman Huff to Universal Oil Products Co.

In method of analyzing gas mixture with mass spectrometer having ionization chamber and sample chamber connected thereto, improvement comprises flowing mixture from sample chamber into ionization chamber while maintaining sample chamber pressure and ionization chamber pressure so low that each component of mixture flows from sample chamber into ionization chamber at rate dependent on partial pressure of component in mixture and independent of partial pressure of any other component of mixture. No. 2,412,236. Harold Washburn to Consolidated Engineering Corp.

In analyzing with mass spectrometer having sample region and ionization region, gas mixture having plurality of components therein which upon ionization form ions of common mass-to-charge ratio, improvement which comprises pressure flowing sample of said gas mixture into ionization region while maintaining sample region pressure and ionization region pressure such that respective components of mixture flow from sample region into ionization region at same rates with which they would flow if present alone, etc. No. 2,412,237. Harold Washburn and Daniel Taylor to Consolidated Engineering Corp.

Method of introducing vaporizable material into discharge device comprising envelope of conducting material, glass envelope sealed to envelope projecting exteriorly of envelope and enclosing space communicating with interior of envelope, and vaporizable material contained within space adjacent seal between glass and conducting envelopes, method comprising subjecting vaporizable material to varying magnetic field to produce induction heating thereof, surrounding seal with body of good conductive material to prevent undesired heating of seal. No. 2,412,302. Percy Spencer to Raytheon Manufacturing Co.

Micro analysis of gas forming small constituent of mixture of gases including steps of introducing at least portion of gases into evacuated zone until known pressure is obtained in zone, introducing into zone substantially pure diluent gas known to have a relatively stable, simple molecule until second known pressure is obtained in zone, etc. No. 2,412,359. Edwin Roper to Stanolind Oil & Gas Co.

Canadian

Process of controlling the feed of material to an air swept pulverizer. No. 439,004 The Babcock & Wilcox Company (James L. Harvey).

Method for destroying or quenching froth, characterized in supplying the froth to a rotating solid body. No. 439,149. Johan Olof Naucler.

*Rubber

As vulcanization accelerator, resinous product obtained by fusing 2-8 mols of paraformaldehyde and 2-8 mols of mercaptobenzothiazole with one mol of reaction product of 1-2 mols of zinc chloride and one mol of guanidine having formula described in patent. No. 2,411,413. Elmer Cook and Edwin Hook to American Cyanamid Co.

Treating rubber comprises vulcanizing it in presence of 1-(p-hydroxyphenylamino-methylene)-beta-naphthol. No. 2,411,427. Albert Hardman to Wingfoot Corp.

Accelerating cure of polychloroprene comprises incorporating therein, prior to cure, a small amount of 3,3,3',3'-tetramethyl-1,1'-spirobisindane-5,5',6,6'-tetrol. No. 2,411,773. Byron Bender to United States Rubber Co.

Making homogeneous thermoplastic composition adapted for molding, calendering and like, comprises milling halogen containing rubber derivative with basic substance of character and in such amount as to retard heat disintegration of halogen containing rubber derivative. No. 2,411,839. William Calvert to Wingfoot Corp.

Composition of matter comprising rubber hydrohalide and litharge. No. 2,411,840. William Calvert to Wingfoot Corp.

Producing molded rubber hydrochloride derivative comprises subjecting rubber hydrochloride and sulfur to vulcanization temperature in press. No. 2,411,841. William Calvert to Wingfoot Corp.

(Continued on following page)

* *U. S. Patents from Vol. 592, Nos. 3, 4, Vol. 593, Nos. 1, 2. Canadian from Dec. 31—Jan. 21.*

Patents Available for License or Sale

The Patent Office is regularly publishing a Register of Patents Available for Licensing or Sale. Patents concerning chemical products and processes appear below.

February 18, 1947

The following patent, owned by the United States Government, as represented by the Secretary of the Interior, is available for licensing, upon a non-exclusive, royalty-free basis. Information relative to this patent should be obtained from: Solicitor, Department of the Interior, Washington 25, D. C.

2,410,043. **Process for Manufacturing Calcium Fluoride.** Patented Oct. 29, 1946. (Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757.) Cyclic process for producing relatively pure calcium fluoride recovered from fluorine usually lost or wasted (i. e., manufacture of fertilizers, steel, etc.) Concentrated solution of hydrofluosilicic acid (evolved from decomposition of materials containing both fluorine and silica) is heated to form hydrofluoric acid and silicon tetrafluoride. Relatively dry calcium fluosilicate is obtained by leading these gases through a reaction chamber containing lime. This calcium fluosilicate is then heated to at least 1300° C., so that molten calcium fluoride and silicon tetrafluoride is obtained. Calcium fluoride is tapped, cooled, and broken up for marketing. Other product is reintroduced into system. Group 28—89. Reg. No. 5,128.

March 4, 1947

2,406,572. **Explosive Perchlorates of Aliphatic Nitrogenous Compounds.** Patented Aug. 27, 1946. Explosive containing as essential constituent perchlorate of basic nitrogenous compound of ethylenic hydrocarbon, such compound having more than two basic nitrogenous groups, only a part of which are combined with perchloric acid. Several examples are set forth in the patent. (Owner) Ralph E. Svoboda, 1501-18 City National Bank Bldg., Omaha, Nebr. Group 33—X2. Reg. No. 5,183.

2,406,573. **Explosive and Process of Making.** Patented Aug. 27, 1946. Explosive contains as essential constituent compound of ethylene diamine of which one amino group is linked to perchloric acid and second amino group is combined with polynitro-aromatic body of acid character. Examples are set forth in the patent. (Owner) Ralph E. Svoboda, 1501-18 City National Bank Bldg., Omaha, Nebr. Group 33—X2. Reg. No. 5,184.

March 11, 1947

The following patent, owned by the United States Government, as represented by the Secretary of the Interior, is available for licensing, upon a non-exclusive, royalty-free basis:

2,411,157. **Means for Collecting Gas Analysis Samples.** Patented Nov. 19, 1946. (Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757.) Sampler comprises an evacuated glass container housed within perforated casing which is lowered by three-wire cable into such restricted sampling spaces as the hold of a ship (after fumigation) and deep bore holes of a mine (after fires). Tip of container is easily broken by solenoid-associated plunger so that gas to be sampled may be quickly drawn into container. Container is resealed by wax held within a cup supported by a shaft normally restrained by an electrically controlled latch. Group 30—11. Reg. No. 5,224.

Regulations under which licenses are granted are issued by the Secretary of the Interior. Applications for licenses should be made to the Solicitor, Department of the Interior, Washington 25, D. C.

Plasticizing vulcanizable rubber compositions comprises mixing with rubber small amount of product produced by subjecting thiophenol to action of aldehyde and aromatic amine. No. 2,411,884. Robert King and George Thielcke to King & Lang, Inc.

New composition of matter, material selected from group consisting of natural rubber and rubber-like polymers of butadiene-1,3,isoprene, piperylene, and 2-chloro-butadiene-1,3 admixed with carboxylic acid ester of one of group consisting of indanols and alkyl substituted indanols. No. 2,411,943. Frank Soday to The United Gas Improvement Co.

Gas expanded rubber comprising closed cells, containing nonoxiding mixture of nitrogen and ammonia. No. 2,412,072. Roger Bascom and Dudley Roberts, deceased, by Dudley Roberts, Jr., executor, to Rubatex Products, Inc.

Sprayable water-dispersed, pressure-sensitive rubber adhesive composition of oil-in-water type, in which rubber is in dispersed phase and tack of rubber is improved by having blended therewith substantially non-acidic and water-insoluble resinous tack producer having much higher compatibility with rubber than cumarone-indene resins. No. 2,412,182. Henry Stephens to Minnesota Mining & Manufacturing Co.

Preparing synthetic rubberlike material having high solvent and freeze resistance comprises polymerizing in aqueous emulsion mixture of 50-80 weight percent of conjugated diolefin hydrocarbon, 10-30 weight percent of nitrile corresponding to formula described in patent. No. 2,412,214. Anthony Gleason to Standard Oil Development Co.

Making rubber-like composition of matter capable of vulcanization with sulfur to product having high tear strength comprises blending together polymerized butadiene synthetic rubber, polyvinyl ester selected from group consisting of polyvinyl chloride, polyvinyl acetate, and copolymers of vinyl chloride and vinyl acetate, and mutual solvent comprising organic condensation reaction product of formaldehyde and turpentine under acidic conditions. No. 2,412,216. Mortimer Harvey to Harvel Research Corp.

Canadian

Vulcanized butadiene-styrene copolymer synthetic rubber comprising about 10 per cent-20 per cent of an aldolnaphthylamine. No. 439,232. R. T. Vanderbilt Company, Inc. (Albert A. Somerville).

*Specialties

Lubricating oil comprising hydrocarbon lubricating oil blended with 1% to 5% by weight of polybutene viscosity index improving thickener and homogeneously blended with 4 to 50% by weight of substantially non-volatile oxy-ester, non-solvent for polybutene at below 100° F. No. 2,411,150. Hector Evans and David Young to Standard Oil Development Co.

Improved mineral oil composition comprising viscous mineral oil and in admixture therewith minor proportion, from 0.1 per cent to 5 per cent, of oil-soluble, phosphorus- and sulfur-containing reaction product. No. 2,411,153. Everett Fuller, Henry Berger and Robert Williams to Socony-Vacuum Oil Co., Inc.

Lubricating composition comprising reaction product of tetrafluoroethylene with saturated non-polymerizable organic compound of general formula XY where X is member selected from hydrogen and halogen and Y is monovalent saturated organic radical, reaction product consisting of from two to 25 tetrafluoroethylene units per unit of organic compound. No. 2,411,159. William Hanford to E. I. du Pont de Nemours & Co.

Composition comprising major proportion of paraffinic and dissolved therein small amount of dicarboxylic-glycol polyester having molecular weight of at least 2,000, there being at least 10 carbon atoms per molecule in at least one of said two reactants and total number of carbon atoms in 1 molecule of dicarboxylic acid together with 1 molecule of glycol being at least 30, and small amount of pour depressor consisting of high molecular weight condensation product of long chain aliphatic compound and aromatic compound. No. 2,411,178. David Young and Eugene Lieber to Standard Oil Development Co.

Waterproof cemetitious composition comprising 50 pounds powdered coquina, 13 pounds Portland cement, 36 pounds aluminum oxide abrasives, 1 pound of powdered mixture of calcium stearate and hydrous aluminum silicate. No. 2,411,213. Dana Johannes, Jr. to International Products Co.

Parasiticidal composition containing as essential active ingredient compound having formula R-S-X-Y in which R is thiazole attached at 2-position, X is methylene radical bearing at least one hydrogen, and Y is aliphatic substituted or unsubstituted amino radical linked through amino nitrogen to X, and carrier therefor. No. 2,411,253. Albert Flenner and Norman Searle to E. I. du Pont de Nemours & Co.

Slasher sizing composition for water-insensitive yarns composed of linear polyamide comprising reaction product of linear polymerforming composition comprises in substantial amount reacting material selected from at least one of groups consisting of (a) monoaminomonocarboxylic acids and (b) mixtures of diamine with dibasic carboxylic acid, sizing composition comprising hydroxylated polyvinyl resin and water-soluble condensation product of N-beta hydroxyethyl urea with formaldehyde. No. 2,411,322. Vernal Hardy and Walter Haefele to E. I. du Pont de Nemours & Co.

Combating insect pects includes exposing them to action of toxic amount of composition containing as essential active ingredient triphenylmethyl methyl ether. No. 2,411,428. Ingenuin Hechenbleikner to American Cyanamid Co.

Stable soap product, comprising soap and small amount of stannic borate stabilizer. No. 2,411,443. Lyle Lofdahl to Industrial Patents Corp.

Composition of matter, characterized by flexibility, resilience, and absence of flaking, made by, mixing exfoliated vermiculite with volatile liquid vehicle containing thermoplastic resinous material, etc. No. 2,411,470. Thomas Shaw to Shawinigan Chemicals Ltd.

Insecticidal composition comprising as active ingredients alkylated naphthalene having formula described in patent, and a member of class of plant toxicants consisting of pyretbrins and rotenone. No. 2,411,530. Robert Dreisbach and Fred Fletcher to The Dow Chemical Co.

Eradicating nematodes from soil and minimizing attack thereby on plants, comprising introducing below soil surface in vicinity of nematodes agent selected from group consisting of 1,1-dihalopropene-2 and the 2-alkyl homologues thereof, wherein alkyl substituent has one to three carbon atoms. No. 2,411,566. Theodore Evans to Shell Development Co.

Lubricating composition comprising major proportion of waxy mineral lubricating oil and wax-modifying amount of Friedel-Crafts condensation product of lower saturated aliphatic ether having general formula R-O-R', where R and R' are alkyl groups having total of less than 10 carbon atoms with aromatic compound selected from group consisting of aromatic hydrocarbons and alkyl, hydroxy, amino, and partially hydrogenated derivatives thereof. No. 2,411,579. Eugene Lieber and Marvin Thorner to Standard Oil Development Co.

**Container wall comprising outer layer of fibrous material and inner dual coating layer impermeable to asphaltum, bonded to but serverable from fibrous layer, said inner dual coating layer comprising first major body undercoating of water-dispersed clay and sufficient adhesive that this first undercoating may isolate second coating from wall, second continuous lesser-body-carrying coating agent thereon of organic resin-like material of methyl cellulose and starch, possessing characteristic for thin film spreading in direct water solution when applied over less thin first undercoating. No. 2,411,580. Willard Manor to Consolidated Paper Co.

Aviation fuel comprising minor portion of spiropentane and major portion of hydrocarbons boiling in gasoline boiling range. No. 2,411,582. Thomas McCulloch to Standard Oil Development Co.

Unctuous, transparent anhydrous grease composed of mineral lubricating oil thickened to smooth grease consistency with mixture of soda and zinc soaps in which ratio of soda soap to zinc soap is between 14:1 and 28:1. No. 2,411,587. Arnold Morway and Alan Beerbower to Standard Oil Development Co.

Corrosion-preventive composition comprising predominant amount of hydrocarbon fraction containing finely dispersed corrosion retardant amount of organic monobasic acid of between 10 and 60 carbon atoms containing radical selected from group consisting of nitrile, nitro, and nitroso radicals which is not more than four carbon atoms removed from acid radical. No. 2,411,593. Willis Routson to Shell Development Co.

Cold-mix method of making butimous water-resistant paving material comprises treating mineral aggregate with rosin acids in oil solvent and agitating mixture to thoroughly coat aggregate with rosin acids, immediately thereafter treating coated aggregate with alkaline material selected from group consisting of hydrated lime and quicklime and adding and mixing liquid cut-back bitumen with said aggregate. No. 2,411,634. Herbert Pearson to Howard Bishop.

Mineral oil composition resistant to foaming comprising major amount of mineral oil and amount at least sufficient to reduce foaming tendency of oil of salt of alkyl alkylene diphosphate having formula described in patent. No. 2,411,671. Herschel Smith and Troy Cantrell to Gulf Oil Corp.

Dry composition capable of imparting corrosion inhibiting characteristics to water and aqueous solutions of alcohols in cooling systems of internal combustion engines consisting of following ingredients in weight percentage proportions of alkali metal borate 40% to 75%, compound of group consisting of alkali metal chromates and dichromates 10% to 35%, and compound of group consisting of alkali metal orthosilicates, alkali metal silico-fluorides and aluminum alkali metal silico-fluorides 5% to 10%. No. 2,411,676. Lloyd Burghart to U.S. Industrial Chemicals, Inc.

Insect repellent comprising 60 parts of pyrethrum marc and 2 parts of N,N-diethylpiperonylamide. No. 2,411,720. Samuel Gertler to the Secretary of Agriculture of the United States of America.

Pot carroting loose animal fibers comprises immersing loose fibers in solution of oxidizing agent and fiber-hydrolytic agent in organic solvent containing not over 50 per cent of water, removing excess solution from treated fibers, drying fibers. No. 2,411,725. Alfred Hodshon and Harold Tucker to John Stetson Co.

Composition providing gas consisting of following named ingredients within range of proportions from maximum of 5000 cu. ft. at 70° F. and atmospheric pressure, of gas selected from class consisting of natural and artificial fuel gases, 25 lbs. of ether, 25 lbs. of benzene, to minimum of 5000 cu. ft. of gas under similar conditions, together with 12.5 lbs. of ether and 12.5 lbs. of benzene. No. 2,411,769. Samuel White.

Solution of phenyl mercury compound in aqueous solvent containing from 1 to 20 parts by weight of salt selected from group consisting of ammonium sulfate, ammonium carbonate, tri-ammonium phosphate, diammonium phosphate, mono-ammonium phosphate, ammonium borate, ammonium tetra-borate, ammonium citrate, ammonium oxalate, ammodium lactate, ammonium formate, ammonium acetate, and ammonium gluconate, together with sufficient ammonium hydroxide to maintain pH above 7. No. 2,411,815. Frank Sowa.

Preparing saponified rosin dry size in form of discrete, free-flowing, readily water-soluble particles and having high apparent density in bulk, comprises step of discharging aqueous mixture comprising saponified rosin and containing not less than 22 and up to 30% by weight of water, based on weight of saponified rosin and water, at from 340° to 380° F. and under pressure of from 110 to 200 pounds per square inch, into drying atmosphere maintained at atmospheric pressure and at temperature of from 240° to about 325° F. No. 2,411,824. James Farrell to Hercules Powder Co.

Rendering textiles, fibers and like material water-repellent comprises treating such material with higher molecular ketene containing substituent hydrocarbon radical of at least 4 carbon atoms, and heating in absence of solvent to produce water-repellence therein. No. 2,411,860. Winfrid Hentrich and Richard Hueter to Heberlein Patent Corp.

In water dispersed adhesive which, upon drying, will yield tacky pressure sensitive film, steps which include dispersing water in limited proportions uniformly throughout smooth plastic tacky material, including reclaimed rubber, compatible resinous tack-producer therefore and soap-forming acid, to form smooth viscous dispersion of the water-in-oil type, etc. No. 2,411,905. Henry Stephens to Minnesota Mining & Manufacturing Co.

Cleaning and polishing composition suitable for automobiles and furniture, capable of producing very thin transparent lustrous preservative film reducible by repeated applications with cloth and thus non-accumulative to thick layer, comprising from ½ to 5% of oil-soluble phenol formaldehyde resin and from 1 to 8% of petroleum soluble metallic salt of carboxylic acid as film forming components, remainder of composition being petroleum hydrocarbons boiling in range of Stoddard solvent, and up to 25% of compatible organic volatile liquid solvent for resin and salt. No. 2,411,938. Jacob Ratner.

Lubricant or cutting oil composition comprising 25% to 40% by volume of carbon tetrachloride and 75% to 60% by volume of reaction product of approximately 88 parts of lard oil, 12 parts of sulphur and 2 parts of pine oil, composition being aged at 70° F. for two weeks. No. 2,412,082. Paul Gabriel.

Compound for improving durability of leather, comprising mixture of raw linseed oil sixty-five percent, petroleum distillate known as Varnolene, thirty percent and pine tar 5 percent, combined with benzaldehyde in proportion of two ounces of latter to one gallon of former mixture. No. 2,412,140. Albert Fischer, fifty per cent to Bernard Winkels.

Producing plaster retarder comprising partially carbonating an alkaline, hydrolyzed, proteinaceous material with carbonating agent to produce retarder containing less than 15 per cent by weight of combined carbon dioxide (dry basis). No. 2,412,156. George King and Manvel Dailey to United States Gypsum Co.

In manufacture of gypsum-core wallboard, improvement comprises mixing with calcined gypsum slurry foam containing solution of water-soluble starch characterized and identifiable by giving paste viscosity reading of 30 to 150 seconds at 95° C. on Dudley viscosimeter pipette when dispersed in water in proportion of 30 grams of starch to 200 grams of water. No. 22,816. Thomas Camp to United States Gypsum Co.

Duplicating pad for hectograph work comprising polyvinyl alcohol 15

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* *U. S. Patents from Vol. 592, Nos. 3, 4, Vol. 593, Nos. 1, 2. Canadian from Dec. 31—Jan. 21.*

parts by weight, glycerol 50.7 parts by weight, antimony trifluoride 0.2 to 2.0 parts by weight, titanium dioxide pigment 4 parts by weight, ethylene glycol 13 parts by weight, calcium chloride 4 parts by weight. No. 2,412,200. Robert Blum, Jr.

Hydrophilic gummous substance in finely divided form with particles thereof having coating comprising member of group consisting of higher fatty acids with carbon atom content of 12 to 18 and amides and alcohols corresponding thereto, coated substance being readily soluble in water. No. 2,412,282. Richard Nelson to Essential Oil Producers, Inc.

Smooth surface covering of linoleum type comprising decorative and wear-resistant surface layer of fire-retardant composition molded to thickness of at least about one-fortieth inch and consists of binder constituting from 20% to 35% by weight of fire-retardant composition and uniformly commingled with binder finely-divided solid water-insoluble substantially non-inflammable filler material constituting from 65% to 80% by weight of fire-retardant composition, etc. No. 2,412,303. Donald Spitzli and Ralph Charlton to Congoleum-Nairn, Inc.

Electrical resistance element durable at high temperature and proof against chemical action, consisting of sintered mass, containing main component silicon carbide and, in smaller quantity, at least one compound, belonging to group of chromium carbide, chromium nitride, chromium silicide and chromium boride, and at least one compound, belonging to group of molybdenum carbide, molybdenum nitride, molybedenum silicide and molybdenum boride. No. 2,412,373. Axel Wejnarth.

Electrical resistance element durable at high temperature and proof against chemical action, consisting of sintered mass, containing as main component silicon carbide and, in smaller quantity, at least one compound, belonging to group of chromium carbide, chromium nitride, chromium silicide and chromium boride, and at least one compound, belonging to group of wolfram carbide, wolfram nitride, wolfram silicide and wolfram boride. No. 2,412,374. Axel Wejnarth.

Electrical resistance element durable at high temperature and proof against chemical action, consisting of sintered mass, containing as main component silicon carbide and, in smaller quantity, at least one compound, belonging to group of chromium carbide, chromium nitride, chromium silicide and chromium boride, and at least one compound, belonging to group of titanium carbide, titanium nitride, titanium silicide and titanium boride. No. 2,412,375. Axel Wejnarth.

Electrical resistance element durable at high temperature and proof against chemical action, consisting of sintered mass, containing as main component silicon carbide and, in smaller quantity, at least one compound, belonging to group of chromium carbide, chromium nitride, chromium silicide and chromium boride, and at least one compound, belonging to group of vanadium carbide, vanadium nitride, vanadium silicide and vanadium boride. No. 2,412,376. Axel Wejnarth.

Killing weeds in active state of growth, consists in applying to weeds substance selected from group consisting of amides and thioamides of phenyl, phenoxy, phenylmercapto, phenylimino, naphthyl, naphthoxy, naphthylmercapto, naphthylimino, and anthracyl, monocarboxylic aliphatic acids, in concentration of at least .05% by weight. No. 2,412,510. Franklin Jones to American Chemical Paint Co.

Making impregnated composite board comprises providing compressible resin-impregnated carrier sheet having character that it is compressible to less than half its thickness when subjected to pressure of at least fifteen hundred pounds per square inch, assembling carrier sheet in dry state between two wood veneer sheets, followed by subjecting assembled sheets to pressure of at least fifteen hundred pounds per square inch in presence of heat, etc. No. 2,412,534. Boardman Randall to Tek-Wood, Inc.

Perspirant inhibiting or retarding composition comprising water-containing vehicle, an aluminum salt selected from group consisting of aluminum sulphate and aluminum chloride, and corrosion inhibiting compound selected from group consisting of aluminum orthophosphate and aluminum pyrophosphate, mol ratio of phosphate to salt of first group being at least one to one. No. 2,412,535. Earl Richardson and Kenneth Russell to Colgate-Palmolive-Peet Co.

Canadian

Method of making a glass cleaner by treating kraft paper with an aqueous solution containing from 75 to 115 cc-glycerine and 150 gms-powdered silica per litre of water, and then drying. No. 438,864. Raymond M. Schlabach.

Fire-retardant composition consisting of binder—20-25%, asbestos fibre—10-30%, antimony trioxide—20-40%, alkaline earth metal carbonate—5-20%, pigment—5-20%. No. 438,898. Congoleum-Nairn, Inc. (Donald Hawkes Spitzli and Ralph Woodard Charlton).

Soap sheet or leaf consisting of methyl cellulose dissolved in water and combined with liquid soap and dried in the form of a thin film. No. 438,964. Edward Howe Mabley.

Ointment comprising a carrier of petroleum jelly and intermixed therewith honeysuckle, licorice root, wild lettuce, mulberry bark, saffron flower, sage herbs, columba root, logwood bezoar, rhubarb root, angelica root, hops seeds, dandelion herb, bitter fruit peel, red elm, gentian root, borneo camphor, beaver castor, skunk oil or fat. No. 439,093 Ing Lloyd (Antonio Allevato).

Making a thermo-selling solid composition by dissolving zein in heat-softened shellac. No. 439,172. American Maize-Products Company (Harry M. Weber).

Solid solution comprising rosin and zein, the zein being dissolved by the rosin. No. 439,173. American Maize-Products Company (Harry M. Weber).

*Textiles

Producing dyeings on nylon fiber with gallocyanine-dyestuffs comprises applying on fiber dyestuff of said group in leuconic form, from alkaline vat, developing dyeing thereon by an after-treatment in bath containing salt of chromic acid and acid, and finally soaping. No. 2,411,249. Georges de Niederhausern to Durand & Huguenin A. G.

In production of dyed twisted cellulose yarn combination with steps of drying, twisting, setting twist by steaming operation and dyeing, of preliminary step of treatment in water under pressure at above 100° centigrade to stabilise dyeing affinity of yarn against effects of uneven steming. No. 2,411,429. Horace Hegan and Edwin Holroyd Sharples to Courtaulds Ltd.

In producing staple fiber, steps of cutting bundle of continuous filamentary material in partially plastic condition to discontinuous lengths by subjecting material to transverse compression along substantial portion thereof immediately adjacent cutting position, etc. No. 2,411,644. Norman Welton to American Viscose Corp.

Apparatus for continuous production of multiplicity of individually extruded threads, comprising rotary draw-off device of adequate axial extent to receive in side-by-side relation multiplicity of freshly extruded threads, traveling liquid bath conveyor means serially disposed horizontally in separately controllable zones each adapted to receive thread multiplicity and to subject same each uniformly to immersive liquid treatment as selected for given zone, etc. No. 2,411,774. Walter Gundelfinger; Constance Gundelfinger, administratrix of said Walter Gundelfinger, deceased.

Making blended fabrics containing casein fibers and natural animal fibers of approximately same shade, includes treating casein fibers so as to form metallic tannate on fibers, blending treated casein fibers with natural animal fibers and then pad dyeing blended fabric to approximately uniform shade with neutral dye bath containing neutral dyeing acid colors. No. 2,412,125. John Conrad to Collins & Aikman Corp.

Making pile fabrics which contain natural staple animal fibers and synthetic fibers derived from casein in pile portion, steps which include treating synthetic fibers derived from casein so as to incorporate light colored metallic tannate in fibers, blending casein fibers with natural animal fibers, fabricating blended fibers into pile portion of pile fabric, pad dyeing animal and synthetic fibers of pile to approximately same shade. No. 2,412,126. John Conrad to Collins & Aikman Corp.

Testing textile elements comprising steps of embedding plurality of such elements in body of generally tubular member composed of flexible material, such as rubber, bending tubular member, inflating tubular member, and contemporaneously causing it to rotate about its axis while maintained in bent condition. No. 2,412,524. Gerald Mallory to Wingfoot Corp.

Canadian

Textile continuous printing method. No. 439,001. The Aspinook Corporation (Dona Leopold Ballou, Viggo Carlsen and Alwin Matthew Heinrich).

*Water, Sewage and Sanitation

Method and apparatus for treating water comprising steps of passing a variable flow of relatively alkaline water upwardly through bed of organic hydrogen zeolite and augmenting said flow by hydrogen-zeolite treated water. No. 2,412,328. John Felsecker to Graver Tank & Mfg. Co., Inc.

Canadian

Method of rectifying water to prevent lime deposition therefrom and to dissolve deposited lime. No. 438,983. Marc Lurie.

Agricultural

Extracting carotene from solid moist fresh vegetable carotene concentrate comprising heating concentrate with edible oil to vaporize water and extract carotene in oil, removing undissolved residue. No. 2,412,707. Harold Barnett.

Refining pyrethrum oleoresins to obtain pyrethrin concentrate stable against resin separation during storage comprises dissolving pyrethrum oleoresins in 2 to 10 volumes of liquid propane, chilling to −30°F. such that soluble and insoluble phase are formed, removing insoluble phase and removing propane from soluble phase thereby forming solvent-free concentrate predominantly of pyrethrins. No. 2,413,107. Wayne Kuhn to The Texas Co.

Biochemical

Recovery of unfermented and unfermentable sugars from saccharified starch solutions. No. 2,413,698. Eduard Farber and James Wallerstein to The Overly Biochemical Research Foundation, Inc.

Manufacture of glycerine by fermentation of saccharified starchy materials, comprises fermenting solution of saccharified materials which contains dissolved polysaccharides and proteins, adding calcium hydroxide to fermenting liquor to maintain alkaline reaction during the fermentation whereby insoluble calcium compounds of polysaccharides and proteins are formed, removing insoluble matter and recovering glycerine from clarified solution. No. 2,413,699. Arthur Schade to The Overly Bio-Chemical Research Foundation, Inc.

Forming soluble keratoprotein from keratin fibre, consisting of treating with concentrated acid between 0° and 40° C., dissolving fibre with solubilizing reagents of reducing agents having property of opening cystine bonds of keratin. No. 2,413,983. Bernard Lustig and Albert Kondritzer to Lawrence Richard Bruce, Inc.

Cellulose

New composition of matter comprising cellulosic derivative selected from cellulose ethers and cellulose esters. No. 2,412,920. Frank Soday to The United Gas Improvement Co.

Low luster regenerated cellulose filaments and yarns comprises spinning filaments and yarns by extruding viscose composition containing quaternary ammonium hydroxide into aqueous coagulating bath having pH between 3.0 and 7.0, and 25% to 40% of water-soluble salt, and regenerating yarns filaments. No. 2,412,969. Francis Cramer to E. I. du Pont de Nemours & Co.

Vegetable glue comprising burst starch in water in ratio of water to burst starch of less than 4 to 1, being reaction product of mixture free from materials possessing coagulating and thickening action on glue, comprising unburst starch, caustic alkali to burst starch between 1% and 12% by weight based on weight of starch, water, and calcium compound. No. 2,413,885. Gordon Pierson to Perkins Glue Co.

Vegetable glue comprising products of reaction of cassava starch and white potato starch in ratio of 7 to 3 and 3 to 7, caustic alkali and water, ratio of water to starch not greater than 2¾ to 1. No. 2,413,886. Gordon Pierson to Perkins Glue Co.

Ceramics

Forming mass of fused refractory oxide comprises charging finely divided oxide into metal mold, heating mass to temperature where oxide melts and fuses in atmosphere which is inert to metal mold and below melting temperature of metal mold, after fused mass has congealed, again heating mass in oxidizing atmosphere to destroy mold but to temperature below melting point of mass. No. 2,412,925. Semon Stupakoff to Stupakoff Ceramic & Manufacturing Co.

Glass melting tank, pairs of electrodes passing transversely through tank ends below normal glass level, cover for tank having batch feed openings through which glass batch introduced is deposited between electrodes, means for creating high density current through glass between pairs of electrodes, and means for creating low density current through the glass occupying the space between oppositely disposed electrodes of respective pairs. No. 2,413,037. Charles De Voe to Corning Glass Works.

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Ceramic body comprising refractory phosphate particles bonded by glassy matrix comprising multicomponent trivalent metal metaphosphate glass. No. 2,413,159. Woldemar Weyl to Monsanto Chemical Co.

Clay body preparation system including sources of supply of various materials for body, plurality of clay body supplying devices, means for drawing off predetermined amounts of materials from selected sources, etc. No. 2,413,330. William Miller to Miller Pottery Engineering Co.

Composition of matter for fired vitreous product, including, alumina, calcium fluoride, magnesium phosphate, plastic ball clay, chromic oxide. No. 2,413,441. Harold Feichter to United States Quarry Tile Co.

Vitreous composition having Q-value of over 2000, comprising lead oxide, silica, at least one alkali metal oxide taken from group consisting of potassium oxide, sodium oxide and lithium oxide, at least one alkali metal fluoride taken from group consisting of sodium fluoride, potassium fluoride and lithium fluoride, at least one bivalent metal oxide taken from group consisting of magnesium oxide, strontium oxide, zinc oxide, barium oxide, calcium oxide and beryllium oxide. No. 2,413,549. Alden Deyrup to E. I. du Pont de Nemours & Co.

Tempering glass sheets. No. 2,413,722. Bernard Long.

Molded magnesia insulation and method of manufacture. No. 2,413,958. August Dinkfeld and Hermann Vieweg to Johns-Manville Corp.

Canadian

Optical glass having the following essential constituents: silicon dioxide 10-25%, barium oxide 10-35%, lead monoxide 10-20%, boron trioxide 10-25% together with substantial quantities of both lanthanum and thorium oxides. No. 439,659. Chance Brothers Ltd. (Raymond Edward Bastick and Wilfred Marsh Hampton).

Coatings

Coated article having surface film which is free from cracks and checks and is stable to changes in atmospheric conditions, film comprising heat-hardened reaction product of mixture comprising 5-25 parts of dense granular cuto-cellulosic flour and 60 parts of water-soluble reaction product of urea and formaldehyde. No. 2,412,599. Halsey Buell to The Carborundum Co.

Producing coatings by evaporation of metal of silver chemical periodic table family from filament selected from tungsten, tantalum, molybdenum and columbium, wherein metal to be evaporated is alloyed with metal selected from platinum and palladium. No. 2,413,604. William Colbert and Arthur Weinrich to Libbey-Owens-Ford Glass Co.

Producing coatings by the evaporation of metal melting below 1900°C. from filament selected from tungsten, tantalum, molybdenum and columbium which it normally does not wet or adhere to, wherein pieces of metal are applied to filament and heated on filament, in which filament has been alloyed with another metal selected from platinum, palladium, iron, nickel and cobalt. No. 2,413,605. William Colbert and Arthur Weinrich to Libbey-Owens-Ford Glass Co.

Making mirrors by deposition of metal on polished support material, comprising evaporating metal from filament made of metal selected from tungsten, tantalum, molybdenum and columbian wherein metal to be evaporated is heated on filament as alloy with beryllium. No. 2,413,606. William Colbert and Arthur Weinrich to Libbey-Owens-Ford Glass Co.

Applying homogeneous surfacing material to bituminous base, comprises applying coating of alkyd resin emulsion to base and forming layer of surfacing material, including dissolved alkyd resin and non-drying oil rendering alkyd resin non-drying and finely divided aggregate on coating. No. 2,413,901. Clyde Abernathy, one-half to Archie Blades.

Manufacturing wrinkle coating compositions, step comprising adding to wrinkle, varnish base including bottom drier and top drier, texture modifying agent comprising drying oil fatty acids and solvent. No. 2,414,006. William Waldie to New Wrinkle, Inc.

Dyestuffs

Manufacture of mordant dyestuffs of 2-aryl-1:3-arylentriazol series, comprising reducing o-nitro azo dyestuff containing sulfonic acid group and corresponding to formula described in patent. No. 2,412,767. Achille Conzetti and Otto Schmid to J. R. Geigy, A. G.

Dyestuffs of the anthraquinone series and process of making. No. 2,412,790. Samuel von Allmen and Hans Eggenberger to Sandoz Ltd.

Dicarbocyanine dyes. No. 2,412,815. John Kendall and Harry Edwards to Ilford, Ltd.

Production of polymethine dyestuffs comprises condensing compound of general formula described in patent. No. 2,412,816. John Kendall and Harry Edwards to Ilford Ltd.

Sulphur dye resulting from thionation of 5 phenyl 1.3.4. trichlorophenthiazone 2 corresponding to formula described in patent. No. 2,412,922. Norbert Steiger to American Aniline Products, Inc.

Metal-free phthalocyanine coloring matter comprises heating arylorthodinitrile selected from phthalonitrile and nitro phthalonitrile and solid, inert diluent in presence of methyl-glucamine and solid alkaline reagent from group of oxides and hydroxides of alkali-metals and alkali-earth metals. No. 2,413,191. Fred Palmer and Peter Gross to E. I. du Pont de Nemours & Co.

Phthalocyanine containing attached to arylene nuclei at least one sulfonhydrazide group. No. 2,413,224. Arthur Fox to General Aniline & Film Corp.

Dyeing film possessing low water imbibition comprising covering side of film with fabric so that fabric and film are in face to face contact throughout length of film, dyeing film by passing film and fabric through bath of selected dye color, etc. No. 2,413,559. Raymond Greenlees to Courtaulds Ltd.

Production of 1-amino-2-sulpho-4-brom-anthraquinone, comprises sulphonating 1-amino-anthraquinone, adding sulphonation mixture to water, salting out sulphonated anthraquinone product, brominating directly and separating 1-amino-2-sulpho-4-brom-anthraquinone from reaction mixture. No. 2,413,790. George Seymour, Victor Salvin and Maurice Miville to Celanese Corp. of America.

Equipment

Liquid dispensing apparatus. No. 2,412,577. Gerald Harman to Harman Equipment Co.

In furnace, charge therein, arranged inwardly of wall of furnace, charge comprising plurality of briquettes stacked to allow free passage of gases between them, means for supplying heat to briquettes, condensing surface in communication with space in which briquettes are arranged, means for evacuating furnace. No. 2,412,582. Sven Hubinette and Francis Cary.

In colloidal mill device, frame, motive source suspended from frame, mill structure supported by and removably secured to frame, mill structure including combination journaling and adjusting means, journaling means forming hollow body, serving for attachment of mill structure to frame, etc. No. 2,412,677. Edwin Eppenbach and Henry Imshaug; said Imshaug to said Eppenbach.

In metering mill, pair of cooperating milling discs, at least one rotatable relative to other, both having grinding surfaces provided with spaced, curved grooves diminishing in cross section from within to without and terminating with reduced ends along circular curve which is concentric with and spaced from outer circumference of discs, etc. No. 2,412,680. Leslie Fisher and Henry Imshaug to Edwin Eppenbach.

Piezocrystal device of the sealed type. No. 2,412,719. Charles Dausmann to Premier Crystal Laboratories, Inc.

Device responsive to changes in wet bulb temperature of air, including means exposed to air, providing electric current flow, means for changing strength of current conformably with increases in moisture content of air, means including means responsive to dry bulb temperature changes in air for oppositely changing strength of current conformably with increases in dry bulb temperature of air. No. 2,412,782. Robert Palmer.

Minimizing corrosion by action of sulphuric acid on metallic surfaces of heat exchanger under circumstances wherein combustion gases containing SO_2 are subjected to catalytic action in passing over hot iron or steel heat absorbing elements located in advance of heat exchanger in direction of gas flow. No. 2,412,809. Walter Harlow to Combustion Engineering Co., Inc.

Air and water separator for removing air or water mixed with hydrocarbons, comprising cartridge containing a wadding of wooden shavings. No. 2,412,841. Earl Spangler.

In conduit for flow of fluid under pressure at 1400° from high pressure side to low pressure side, having valve seat across conduit, valve extending through seat when in seated position, etc. No. 2,412,913. Leo Schrader to Standard Oil Development Co.

Apparatus for applying fluorescent coating to wall of open ended envelopes for gaseous discharge devices comprising reservoir for fluorescent coating material, means for holding envelopes in vertical position, unitary nozzle member, means to conduct liquid from reservoir to nozzle, etc. No. 2,412,954. Vincent Zdancewicz.

Drying oven control. No. 2,412,990. Orlin Kruse to American Can Co.

Apparatus for assorting solids suspended in liquid, comprises rotating impeller having vanes for mixing air, solids and liquid in lower portion of solids suspended in liquid; rotating disc spaced above vanes; conduit means for supplying pulp to periphery of impeller; means for supplying air to impeller, impeller being adapted to move pulp from periphery toward the central portion, to mix air, solids and liquid, and eject the mixture of air, solids and liquid. No. 2,413,015. Paul Wigton.

Chemical feeding apparatus. No. 2,413,029. Artie McFarland to McFarland Manufacturing Corp.

Fire preventing system, impervious intermediate wall separating spaces and impervious outer wall separating second space from surrounding atmosphere; means for delivering inflammable fluid to first space; means for maintaining fire-extinguishing fluid in second space at pressure to maintain pressure differential across one of walls, etc. No. 2,413,087. John Urbany.

Device for conveying articles through bath comprising conical perforated drum rotatable on longitudinal axis in horizontal plane, having spiral internal flange by which articles deposited are advanced therethrough. No. 2,413,094. Kenneth Yost to Remington Arms Co., Inc.

Conductor cable of indefinite length for detection of abnormal temperature conditions at any location adjacently along it, comprising electrically conductive tubing element adapted for bending on small radius of curvature, uninsulated electrical conductor extending through and spaced from tubing element, etc. No. 2,413,125. Lyman Walbridge to Fenwal, Inc.

Refractometer for chemical reactions. No. 2,413,208. Robert Barnes to American Cyanamid Co.

Benzol scrubber having emulsion of wash oil and water formed in bottom comprises introducing wash oil into top of scrubber, introducing gas into lower part, providing heat to break down emulsion into oil and water, draining water from bottom, draining oil. No. 2,413,238. John Liptak to The American Steel & Wire Co. of New Jersey.

In apparatus for agglomerating or coalescing material distributed in liquid, combination of plurality of primary wall members, secondary wall member projecting between primary wall members, liquid supply means, liquid withdrawing means, said means being so related to primary wall members that liquid flows between primary wall members around secondary wall member, etc. No. 2,413,375. Richard Pomeroy, one-half to H. Darwin Kirschman.

Filter unit comprising tubular body of assembled sheets of filter material, sheets extending generally radially from inner surface of body and being juxtaposed with one edge of each sheet lying in inner surface of tubular body and opposite edge of each sheet lying in outer surface of tubular body, etc. No. 2,413,431. Southwick Briggs.

Converter for producing carbon black from hydrocarbon gases, comprises cylindrical refractory lined reaction chamber provided at one end with flue outlet and at opposite end with separate gas and air inlets, etc. No. 2,413,586. Robert Skoog to United Carbon Co., Inc. (Maryland).

Flickering beam spectrophotometer. No. 2,413,660. Edwin Stearns, Jr. to American Cyanamid Co.

Agglomerating device. No. 2,413,693. Frank Derfler to Aluminum Co. of America.

Hollow edge-filtration filter-element formed of layers of rugose-surface, fluid-impervious material in face-to-face contact providing separated shallow filtering spaces through which filtrate passes, closing one end of filter-element, the other end remaining open as discharge-port, etc. No. 2,413,769. Walter Kasten to Ralph Skinner.

Adsorber comprising vertically disposed casing, first bed of adsorbent material lying transversely of longitudinal axis of casing and adjacent to upper portion, second bed of adsorbent material lying transversely of longitudinal axis of casing, spaced from lower portion, third bed of adsorbent material lying transversely of longitudinal axis of casing, etc. No. 2,413,771. Enrique Luaces to Chemical Developments Corp.

Apparatus for converting tow to top. No. 2,413,969. Vernal Hardy to E. I. du Pont de Nemours & Co.

Sediment testing device. No. 2,414,044. Bernard Kinyon.

Soaking pit and method of operating. No. 2,414,069. Richard Snow to The American Steel & Wire Co. of New Jersey.

Explosives

Preparing explosive assembly for use, where assembly comprises stick of explosive and tubular structure comprising outer non-metallic shell, rigid tubular sheath of explosive property modifying medium constituting lining within shell and bore of which closely approximates external diameter of stick of explosive, etc. No. 2,412,581. Daniel Huyett and Frank Pollock to Atlas Powder Co.

In body containing explosive charge, detonator in charge, friction primer for igniting detonator, member having friction portion for igniting primer, spring means for urging member relative to friction primer, dislodgable means for normally locking member against movement relative to friction primer, etc. No. 2,412,636. Frank Short.

In device for automatically charging rolls, combination of charging trough, safety loading door, means for supporting charging trough, means for actuating charging trough from safety loading door to position over rolls and return, means for tilting charging trough over rolls, means for opening and closing safety loading door, etc. No. 2,412,658. Joseph Stuart, II and Kurt Wassen to Hercules Powder Co.

Petard designed for front explosion comprising axially symmetric body, percussion fuse means, explosive charge, axial tail piece adapted for handling petard, projecting annular rim forward of petard, etc. No. 2,412,967. Joseph Church and Wilfred Thibodeau.

Sheating composition for explosive cartridges comprising flame suppressing chemical and expanded perlite. No. 2,413,516. Carl Pratt and James Farr to Atlas Powder Co.

Explosive composed of nitroglycerin and fixing product comprising soya bean meal de-oiled and in undenaturate condition. No. 2,413,946. Michele Bonotto to Dorothy Di Frasso.

Food

Dairy product selected from group consisting of milk, buttermilk, butter, cheese, powdered milk, powdered cream and whey, containing substantial quantity of non-toxic, water soluble alkali diacetate, quantity of alkali diacetate effective to inhibit growth and development of bacteria and mold. No. 2,412,596. Hans Bauer and Elmer Glabe to Stein, Hall & Co., Inc.

Coating fresh fruit consists in forming solution of waxy material in volatile petroleum distillate solvent immiscible with water, mixing solution with aqueous medium to form temporary emulsion applying emulsion to fruit. No. 2,412,686. Arthur Kalmar to Food Machinery Corp.

Whitening naturally colored shell eggs comprises disintegrating and removing bloom of shell by treating shell with solution containing oxidizing agent. No. 2,413,631. James Ingle to Industrial Patents Corp.

Producing gelatin-containing food product which remains fluid at temperatures down to congealing point, comprising boiling gelatin hydrosol subject to gelation, in presence of phosphoric acid and retaining sufficient phosphoric acid to reduce pH to 5.9 or less. No. 2,413,815. Albert Epstein.

Ion exchange treatment of sugar. No. 2,413,844. Franklin Rawlings to The Dorr Co.

Inorganic

Concentrating ammonium thiosulfate solutions comprises evaporating solutions in contact with ammonia. No. 2,412,607. Henry Farr and John Ruhoff to Mallinckrodt Chemical Works.

Making luminescent screen comprising steps of covering horizontal foundation with liquid solution containing solute capable of being precipitated, distributing phosphor material over exposed surface of solution, allowing at least portion of phosphor material to settle into contact with foundation, adding precipitant to solution to form precipitate, allowing precipitate to settle into contact with phosphor material removing liquid from foundation. No. 2,412,654. Meier Sadowsky to Radio Corp. of America.

Producing contact material from inorganic gel, improvement comprises forming gel from reactants, feeding gel to ageing zone while still wet and before any ageing has taken place to form moving bed of gel in ageing zone, maintaining gel at thickness and temperature to rapidly raise temperature in range of 120° –210° F., moving gel through ageing zone to drying zone at rate that gel remains in ageing zone for 10 minutes to 2 hours, while moving through ageing zone being contacted with atmosphere of steam and air to maintain recited temperature without dehydration. No. 2,412,958. John Bates and Hubert Shabaker to Houdry Process Corp.

Reacting in aqueous solution alkali metal aluminate and water-soluble salt of metal capable of forming water-insoluble metal aluminate, in presence of compound yielding NH_4+ ions, separating insoluble metal aluminate and washing insoluble aluminate to remove soluble salts. No. 2,413,184. William LaLande, Jr. to Porocel Corp.

Removing volatile metal halide from non-aqueous fluid containing same, comprises contacting with alkali metal acid sulfate to form alkali metal sulfate, metal sulfate, and hydrogen halide. No. 2,413,185. William LaLande, Jr., to Porocel Corp.

Method and apparatus for hydrogen sulfide determination. No. 2,413,261. Wilton Stackhouse to The United Gas Improvement Co.

Forming solid $MgCl_2$-MgO product from $MgCl_2$ solution and of decomposing $MgCl_2$ in product. No. 2,413,292. Niels Christensen to Combined Metals Reduction Co.

Recovering selenium as elemental selenium from selenium bearing baghouse dust comprising preparing charge by intermixing 5% by weight of sulphuric acid with portion of selenium bearing material, etc. No. 2,413,374. Albert Phillips, Yurii Lebedeff and James Crandall to American Smelting & Refining Co.

Producing pure iron powder comprises passing electric current between impure iron anode and cathode through molten salt electrolyte comprising 10% to 60% ferrous chloride and remainder being at least two salts selected from sodium chloride, potassium chloride, and calcium chloride. No. 2,413,411. William Kroll.

In preparation of nitrogen compounds, step which comprises subjecting divalent metal carbonate to action of ammonia and oxide of carbon at 400° to 1000° C., in apparatus constructed of zirconium silicate refractory. No. 2,413,469. Carl Schweitzer to E. I. du Pont de Nemours & Co.

Producing titanium dioxide comprises extracting with H_2SO_4 mixture of titanium-bearing ore containing in combined form in excess of 60 parts of iron for each 100 parts of titanium oxide and sufficient added titanium dioxide recovered in subsequent hydrolysis to produce in subsequently-formed acid solution ratio of Fe content to TiO_2 content of less than 4:5, etc. No. 2,413,640. Robert McAdam to E. I. du Pont de Nemours & Co.

Producing titanium dioxide comprises steps of extracting with concentrated H_2SO_4 titanium-bearing ore containing in combined form in excess of 60 parts of iron for each 100 parts of titanium oxide in presence of sufficient added recycled titanium sulfate solution recovered in subsequent stage of process after iron removal but prior to hydrolysis to produce in subsequently-formed acid solution ratio of Fe content to TiO_2 content of less than 4:5, etc. No. 2,413,641. Robert McAdam to E. I. du Pont de Nemours & Co.

Producing lithium hydroxide comprises forming mixture selected from beta spodumene obtained by heating alpha spodumene without additants thereto, lime and water; and alpha spodumene heated with lime to a sintering temperature and water, heating mixture until solids are digested and lithium hydroxide is formed. No. 2,413,644. Clifford Nicholson to Nepheline Products, Ltd.

Recovering alumina and hydrochloric acid. No. 2,413,709. John Hoffman.

Producing elemental sulphur. No. 2,413,714. William Keeling to Koppers Co., Inc.

Preparing pure titanium nitride, comprises reacting anhydrous ammonia and titanium halide while reactants are in gaseous phase, decomposing resulting reaction product at temperature above 1000° C., in presence of current of nitrogen and hydrogen, and recovering nitride. No. 2,413,778. Carl Olson to E. I. du Pont de Nemours & Co.

Making sodium sulfide, comprises heating aqueous solution of sodium thiosulfate containing sodium hydroxide in equivalent quantity with equivalent quantity hydrogen in closed vessel at between 275° and 350° C., under pressure equal to vapor pressure of solution at operating temperature for time sufficient to form sodium sulfide. No. 2,414,042. Charles Highhill to The Dow Chemical Co.

Treating hydrolyzable titanium sulfate solution employed in titanium oxide pigment manufacture to remove antimony sulfide reagent introduced to promote clarification comprises, prior to hydrolysis adding 1 gallon sulfonated oil per 10,000 to 20,000 gallons liquor, then filtering resulting mixture. No. 2,414,049. George Lewis to E. I. du Pont de Nemours & Co.

Canadian

Producing bulk cobalt catalysts by reacting a base containing cobalt with a solution of an acid of phosphorus in an organic solvent. No. 439,390. Allied Chemical & Dye Corp. (Marion H. Gwynn).

Manufacturing high density strontium peroxide by reacting a soluble peroxide and a soluble strontium salt in an alkaline aqueous medium at temperatures between 50° C and 75° C. No. 439,401. Buffalo-Electro-Chemical Co., Inc. (Lynn H. Dawsey and Hans A. Rudolph).

Method of making zirconium oxide for use as an opacifier from zirconium-carbon-oxygen intermediates. No. 439,442. The Titanium Alloy Manufacturing Co. (John B. Miller)

Process for producing lithium hypochlorite by reacting an alkaline earth metal hypochlorite with a lithium salt of the class consisting of lithium sulphate and lithium carbonate. No. 439,561. The Mathieson Alkali Works (Edward C. Soule).

Method for applying on a glass wall a luminescent matter consisting of a salt of an oxygenated inorganic acid. No. 439,601 Societe Anonyme pour les Applications de l'Electricite et des Gaz Rares (Andre Claude)

Method of producing elemental sulphur by introducing hydrogen sulphide and sulphur dioxide into an atmosphere of water vapour maintained over a body of aqueous liquid. No. 439,621. Marvin J. Udy.

Preparing an active nickel catalyst by heating a nickel salt of an organic acid in a mixture of white mineral oil and a fatty oil to decomposition temperatures under a vacuum. No. 439,635. The Best Foods, Inc. (Hans W. Vahlteich and Ralph H. Neal).

Manufacture of sodium aluminate-sodium carbonate briquettes. No. 439,641. Canadian Industries, Ltd., (James Muir Smith)

In the manufacture of sulphamic acid the steps of bringing together urea and oleum in a liquid reaction medium cooling throughout the reaction to inhibit formation of sulphamic acid and to maintain the reaction medium liquid throughout and thereafter converting the liquid mass to sulphamic acid. No. 439,655. Canadian Industries, Ltd. (Donald Paul Hill and George Ashley Peirce)

Luminescent composition comprising a fluorochloride of barium or strontium and which has been heat treated at a temperature of the order of 1,500° F. No. 439,740. Canadian Kodak Company, Ltd. (Herbert J. Dietz)

Making tungsten carbide by mixing tungsten and carbon in a refractory metal container and holding at an elevated temperature. No. 439,744. Canadian Westinghouse Company, Ltd. (Joseph Gordon)

Luminescent material consisting of a manganese activated combination of oxides of zinc, magnesium and cadmium and an oxide of an element selected from the group of elements consisting of silicon and germanium. No. 439,789. Radio Corporation of America (Humboldt W. Leverenz)

Medicinal

Producing improved fat-soluble vitamin concentrate, comprises contacting fat-soluble vitamin-containing marine oil with solvent selected from aliphatic and alicyclic monohydroxy alcohols containing from 3 to 6 carbon atoms, esters formed by reaction of aliphatic and alicyclic alcohols with aliphatic monocarboxylic acids, etc. No. 2,412,561. Loran Buxton to National Oil Products Co.

Producing fat-soluble vitamin concentrates, one rich in vitamin esters and one rich in vitamin alcohols, comprises saponifying from 60% to 95% of saponifiable content of fat-soluble vitamin-containing marine oil, extracting resulting saponaceous mass with water-immiscible solvent which will not dissolve soap to recover unsaponified fraction containing vitamin alcohols and vitamin esters, etc. No. 2,412,766. Loran Buxton to National Oil Products Co.

Water soluble salt of dialkylamino alkanol ester of p-alkoxy benzoic acid. No. 2,412,966. Walter Christiansen and Sidney Harris to E. R. Squibb & Sons.

Preparing progestational agent, comprises ozonizing solution of 5,6-dibromocholestanone in ozone-inert solvent in presence of acid-binding agent. No. 2,413,000. William Ruigh to E. R. Squibb and Sons.

Preparation of riboflavin concentrates. No. 2,413,055. Abraham Leviton to the Secretary of Agriculture of the United States of America.

Producing substance from group consisting of salt of nicotinic acid and nicotinic acid, reacting trigonelline salt with ammonium salt, and halogen acid with application of heat. No. 2,413,615. Sidney Fox to The Upjohn Co.

Alpha-(meta-hydroxyphenyl) - beta - methyl - amino-ethanol para-amino-benzoate. No. 2,413,656. Melville Sahyun and John Faust to Sterling Drug, Inc.

Stabilized magma and method of making. No. 2,414,024. Frank Cooper to Wyeth, Inc.

Metallurgy, Ores

Manufacturing copper-bearing austenitic stainless steel insensitive to intergranular corrosion, involving additions of oxygen compound of copper to charge of plain carbon steel scrap and nickel in electric furnace. No. 2,412,661. Stephen Urban to Illinois Steel Corp.

Producing carburized case on outside only of lengths of steel tubing comprises passing same through furnace chamber as continuous string which extends beyond ends of chamber and which is relatively gas-tight at joints, maintaining carburizing atmosphere in chamber and neutral atmosphere in string. No. 2,412,802. Ernest de Coriolis to Surface Combustion Corp.

Making selenium plate, comprises coating with amorphous selenium, maintaining temperature of coated plate at about 100° C., for a brief time without application of pressure, raising temperature to about 190° C. while pressure is applied against surface of selenium. No. 2,413,013. Arthur von Hippel to Federal Telephone & Radio Corp.

Reducing nickel oxide and melting nickel comprises mixing nickel oxide with carbonaceous reducing agent, heating in atmosphere containing

carbon dioxide and having controlled hydrogen content controlling reducing atmosphere in accordance with composition furnace atmosphere, etc. No. 2,413,215. Joseph Carter and Ray Gensler to The International Nickel Co., Inc.

Producing iron oxide and production of powdered iron. No. 2,413,492. Charles Firth to Continental Machines, Inc.

Producing dies from powdered metallurgy. No. 2,413,512. Louis Morin, one-half to Davis Marinsky.

Hot worked article hardened by heat treatment and formed from steel containing 0.8 to 1.25% of carbon, 0.2 to 0.75% of molybdenum, 1 to 1.5% of silicon, remainder effectively iron. No. 2,413,602. Frederick Bonte to The Timken Roller Bearing Co.

Tin ore treatment. No. 2,413,762. Gregoire Gutzeit and Elliott Roberts and Robert Thompson to The Dorr Co.

Heat treating complicated aluminum alloy castings, including silicon, for reducing differential internal residual stresses comprising: solution annealing at 980° F. for twelve hours, quenching in mineral oil at temperature between 100° and 175° F. No. 2,413,765. Louis Hirsch and Frederic Cari to General Motors Corp.

Heat treating magnesium base alloy work piece includes immersing in molten bath of KCNO at solution heat treating temperature until distribution of alloy components has been improved, removing from bath and air quenching. No. 2,413,928. James Simpson to American Cyanamid Co.

Heat-treating bath for aluminum including 87% KCNO and 13% KCl. No. 2,413,929. James Simpson to American Cyanamid Co.

Insulating silicon steel, comprises applying acid phosphate coating to steel and annealing in slightly oxidizing atmosphere of wet gas consisting of 85% nitrogen and 15% hydrogen at 875° C. No. 2,413,949. Michael Broverman to General Electric Co.

Canadian

Process of producing objects from powdered metal carbides. No. 439,409. Cutanit, Ltd. (Martin Littmann).

Concentrating sulphide ore by froth floation in the presence of the reaction product of a dithiophosphate and phosgene. No. 439,490. Arthur H. Fischer.

Organic

Alkylation of benzene with ethylene comprises passing major proportion of benzene and minor proportion of ethylene at 80° F. to 120° F., at pressure in range of zero to 100 pounds gage into intimate contact with catalyst comprising addition compound of boron fluoride and orthophosphoric acid, etc. No. 2,412,595. William Axe to Phillips Petroleum Co.

Separating mixture predominately containing at least two of bases 3-picoline, 4-picoline, and 2,6-lutidine comprises including in mixture orthohydroxy-chlorobenzene and fractionally distilling the mass. No. 2,412,649. George Riethof.

Separating mixture containing at least two of bases 3-picoline, 4-picoline, and 2,6-lutidine comprises including in mixture formic acid, fractionally distilling under reduced pressure. No. 2,412,650. George Riethof.

Separating mixture predominately containing at least two of bases 3-picoline, 4-picoline, and 2,6-lutidine comprises including in mixture aliphatic acid having 2 to 5 carbon atoms in molecule, fractionally distilling mass. No. 2,412,651. George Riethof.

Sulfonating hydrocarbon selected from class consisting of aliphatic hydrocarbon, alicyclic hydrocarbon and higher alkyl monocyclic aromatic hydrocarbon, and mixtures thereof, comprising reacting hydrocarbon in dark with mixture of sulphur dioxide and chlorine in presence of small amount of organic peroxide, hydrolyzing resultant product with basic hydrolyzing agent. No. 2,412,679. Henry Grubb and Elton Tucker to Standard Oil Co.

Thioglycolic amides having formula described in patent. No. 2,412,700. Arnold Weissberger, Charles Kibler and Richard Young to Eastman Kodak Co.

Preparing nicotinamide comprising contacting nicotinic acid with stream of dry ammonia gas at temperature to liberate water of reaction, supplying ammonia gas during reaction in amount in excess over that required to react with nicotinic acid, etc. No. 2,412,749. Edwin Pike and Robert Shane to Gelatin Products Corp.

Manufacture of butadiene, improvement comprises reacting propane with formaldehyde under anhydrous conditions and at 75° to 115° F. in contact with zirconium chloride condensation catalyst to effect condensation of propane with formaldehyde, converting resulting condensation product to butadiene by contacting it with dehydration catalyst adapted to split off water from condensation product. No. 2,412,762. Arnold Workman to Cities Service Oil Co..

Preparing lead phthalate composition selected from group consisting of dibasic, monobasic, and normal lead phthalate and mixtures thereof comprises forming aqueous slurry of lead monoxide and while agitating and maintaining temperature of slurry between 15° C. and 100° C., slowly adding phthalic acid. No. 2,412,784. Alexander Stewart and Adrian Pitrot and Leonard Kebrich to National Lead Co.

Preparing thiocyano aliphatic ethers of endoethylene cyclopentanols comprises reacting aliphatic thiocyano alcohol of formula HO-A-(O-A)n-1-SCN, wherein A is alkylene group of at least two carbon atoms and n is number from one to four, inclusive in presence of boron trifluoride catalyst with adduct of cyclopentadiene and mono-olefinic compound having only neutral substituents. No. 2,412,799. Herman Bruson to The Resinous Products & Chemical Co.

Beta-alkyl-thio acrolein mercaptals. No. 2,412,814. John Kendall and Harry Edwards to Ilford, Ltd.

New compositions of matter aminophthalalkylolimides corresponding to formula described in patent. No. 2,412,817. Harold Lacey and Robert Brouillard to American Cyanamid Co.

Separating fatty acid and rosin acid components of acids derived from hydrolysis of kraft pulp mill soap comprises reacting mixed acids with theoretical quantity of ethylene diamine at elevated temperature to form fatty acid amide, dissolving mixture in heated solvent selected from methanol, carbon tetrachloride and hexane, cooling solution, removing precipitated amide. No. 2,412,818. Joseph Lovas and James Loughlin.

Recovering furfural from admixture with hydrocarbons having boiling points so close to that of furfural as to be difficult to separate from furfural by distillation comprises subjecting furfural-hydrocarbon mixture to water extraction in presence of liquid hydrocarbon having boiling point lower than boiling point of furfural. No. 2,412,823. Bertrand Mayland to Phillips Petroleum Co.

Separating butadiene in highly concentrated state from other normal C_4 hydrocarbons, comprises subjecting hydrocarbon material comprised of normal butane, 1-butene, 2-butene, and butadiene, to fractional dis-

tillation in presence of sulfur dioxide in amount to form minimum-boiling azeotropes with all normal butane and 1-butene contained in material but insufficient to form azeotrope with major portion of 2-butene contained in material, etc. No. 2,412,880. Frederick Frey to Phillips Petroleum Co.

Producing trimethylene chlorbromide. No. 2,412,882. Clyde Gardenier to Thomas A. Edison, Inc.

Preparing sulphinic derivatives of organic compounds comprises treating organic compound having aliphatic group with thionyl halide and minor proportion of halogen in presence of actinic rays. No. 2,412,909. Dwight Potter to Colgate-Palmolive-Peet Co.

Production of butadiene from cracked petroleum fraction comprises passing petroleum fraction consisting of butene-2 to catalytic dehydrogenation zone to convert butene-2 to butadiene, separating dehydrogenated products from catalytic dehydrogenation zone, separating from dehydrogenated products hydrocarbons having three or less carbon atoms and five or more carbon atoms to molecule, etc. No. 2,412,911. Harold Scheeline to Standard Oil Development Co.

Manufacture of alkyl esters of aceto-acetic acid comprises passing vapours of beta-hydroxybutyric ester of saturated aliphatic alcohol containing not more than four carbon atoms, over dehydrogenating catalyst at 200° and 400° C. No. 2,412,928. Karl Tuerck and Hans Lichtenstein to The Distillers Co., Ltd.

Production of cyclopentene by catalytic dehydrogenation of cyclopentane. No. 2,412,936. Harold Hepp to Phillips Petroleum Co.

Forming aqueous solution by dissolving tetrasodium salt of amino acid in water, adding stearic acid, and heating until pH is stabilized at 8, filtering while hot to remove excess stearic acid. No. 2,412,944. Frederick Bersworth.

Product consisting of reaction product of aliphatic polyhydroxy alcohol and alkali metal salt of lower alkyl amino polyacetic acid. No. 2,412,945. Frederick Bersworth.

Process for making N-alkoxymethyl polyamides, comprises heating formaldehyde and aliphatic alcohol consisting of alkyl group and hydroxyl group with solution in monobasic carboxylic acid of linear polycarbonamide, etc. No. 2,412,993. Arthur Larchar to E. I. du Pont de Nemours & Co.

Process of refining substance selected from group consisting of fats, fatty acids and waxes, step of subjecting intimate mixture comprising said substance to be refined and small percentage of finely divided spent hydrogenation catalyst to hydrogen pressure between fifty and seven hundred and fifty pounds per square inch at temperature slightly above 212° F. No. 2,413,009. Ilona Taussky.

Inhibiting polymerization of acetaldehyde during storage and distillation, comprises incorporating in acetaldehyde-containing solution small amount of metal resinate soluble in solution. No. 2,413,038. Joseph Dinwiddie to E. I. du Pont de Nemours & Co.

Preparing methylsilicon chlorides, comprises reacting methyl magnesium halide with silicon tetrachloride in mutual solvent, fractionally distilling liquid reaction product to recover methylsilicon chlorides. No. 2,413,049. James Hyde to Corning Glass Works.

Alkyl silicon chlorides and their preparation. No. 2,413,050. James Hyde to Corning Glass Works.

Deriving rosin hydrocarbons from acidic rosin materials, comprises heating acidic rosin material in presence of 0.5% to 20% of sulfur at temperature between 100° C. and 250° C., decarboxylating the sulfur-treated material by application of heat at decarboxylation temperature above 250° C., heating being continued until sulfur-treated material is extensively decarboxylated. No. 2,413,052. Nicholas Kalman to Ridbo Laboratories, Inc.

d (+)-Alpha, gamma-dihydroxy-beta, beta-dimethyl-butyric-acid-(hydroxy-alkyl)-amides and process for manufacture. No. 2,413,077. Otto Schnider to Hoffmann-La Roche Inc.

Continuous hydrogenation of nitrohydroxy compounds, comprises mixing solution of nitrohydroxy compound in inert solvent with excess hydrogen, passing resulting mixture under elevated pressures through hydrogenating zones with pellets of inert character impregnated with hydrogenation catalyst. No. 2,413,153. Walter O'Loughlin to Commercial Solvents Corp.

Manufacturing sulfonated alkylated monocyclic aromatic hydrocarbons by condensation of unsaturated aliphatic hydrocarbons with benzene and homologues under influence of aluminum chloride by means of Friedel-Crafts synthesis, etc. No. 2,413,161. Ernst Zerner and William Kaplan to Sun Chemical Corp.

Sulfuric derivative of saturated aliphatic hydrocarbon having at least 8 carbon atoms per molecule, comprises chlorinating saturated aliphatic hydrocarbon and reacting with strong sulfonating agent in presence of alkyl ester of aliphatic carboxylic acid. No. 2,413,199. Robert Taylor to The Atlantic Refining Co.

Dehydration of hydrohalogen acid by distillation. No. 2,413,205. James Word, Jr. and John Sims to Phillips Petroleum Co.

Recovery of crotonic acid from crude product, resulting from oxidation of crotonaldehyde, containing crotonic acid, crotonic anhydride, crotonaldehyde, an oxidation catalyst, and oxidation by-products, comprising, distilling, etc. No. 2,413,235. Douglas Kennedy to Shawinigan Chemicals, Ltd.

Azeotropic distillation of toluene. No. 2,413,245. Homer Reed and Benjamin Holt to Union Oil Co. of California.

N-substituted amino monohydric secondary alcohols and process for preparing. No. 2,413,247. Murray Senkus to Commercial Solvents Corp.

1,5-Bis (1-nitro-3,5-dioxacyclohexyl) 2,4 dioxapentane. No. 2,413,249. Murray Senkus to Commercial Solvents Corp.

1,5-Bis (1-amino-3,5-dioxacyclohexyl) 2,4 dioxapentane. No. 2,413,250. Murray Senkus to Commercial Solvents Corp.

Purifying indene derived from light oil containing impurity, comprises commingling indene with less than 5% by weight of finely divided material selected from metals and alloys of groups IA and IIA of periodic system, separating indene in purified form from resulting mass. No. 2,413,253. Frank Soday to The United Gas Improvement Co.

Refining unsaturated hydrocarbon material with an alkali or alkaline earth metal. No. 2,413,254. Frank Soday to The United Gas Improvement Co.

Refining styrene and methyl styrene. No. 2,413,255. Frank Soday to The United Gas Improvement Co.

Refining light oil diolefine fraction containing diolefine material and contaminated with impurity including acetylenic material. No. 2,413,256. Frank Soday to The United Gas Improvement Co.

Purifying piperylene. No. 2,413,257. Frank Soday to The United Gas Improvement Co.

Refining aromatic hydrocarbons with acid-acting metallic halides. No. 2,413,260. Frank Soday to The United Gas Improvement Co.

Producing alpha-mercaptocarboxylic acids selected from alkyl and phenalkyl carboxylic acids, improvements comprising diluting alpha-chlorcarboxylic acid selected from alkyl and phenalkyl carboxylic acids with water in reaction vessel, preheating diluted acid to 45 to 80° C., adding to diluted acid during continuous agitation fused sodium thiosulfate, etc. No. 2,413,361. Harry Martin to Martin Laboratories, Inc.

Fumigant, addition product of ethylene oxide and sulfur dioxide having formula $(CH_2)_2O.SO_2$. No. 2,413,405. Frank Campbell and Willis Fernelius.

Fumigant, addition product of dioxan and sulfur dioxide in ratio of one mol of former to two mols of latter, having formula $O_2S.O\ (C_2H_4)_2O.SO_2$. No. 2,413,408. Willis Fernelius and Frank Campbell.

Preparing 3,3'-dichloroindanthrone wherein compound of class consisting of indanthrone and 3,3'-dibromoindanthrone is reacted with chlorine gas. No. 2,413,483. Clarence Belcher to E. I. du Pont de Nemours & Co.

Preparation of isomer-free benzyl methyl acetoacetic methyl ester from monosodium acetoacetic methyl ester. No. 2,413,493. Alvin Flisik, Leonard Nicholl and William Bitler to Kay-Fries Chemicals, Inc.

In production of vinyl cyanide, reacting hydrocyanic acid with acetylene in vapor phase at 350 to 700° C. in presence of solid catalyst for reaction comprising compound selected from alkali metal cyanides and alkali metal compounds capable of reacting with hydrocyanic acid to form alkali metal cyanides, improvement consists in adding small amount of water vapor to reaction mixture. No. 2,413,496. Howard Green and Donald Taylor to E. I. du Pont de Nemours & Co.

Fiber consisting of alkyl-benzene-sulfonic acid salt of pseudothiohydantoin, substituted in position 3 by protein radical selected from phosphoproteins, globulins, and prolamines, having formula described in patent. No. 2,413,501. Oskar Huppert.

In preparing Bz-1:Bz-1'-dibenzanthronyl and its halogen and methyl derivatives wherein condensation of benzanthrone compound is effected by means of oxidizing agent, step which comprises carrying out condensation of benzanthrone compound in alkyl sulfuric acid of class consisting of methyl sulfuric acid and ethyl sulfuric acid. No. 2,413,507. Henry Lee and Edward Howell to E. I. du Pont de Nemours & Co.

In thermostatically operated device for use over a wide range of temperature from low of at least 0° F. to high of approximately 800° F., bulb in zone of heat, expansive and contractible chamber, conduit interconnecting bulb and chamber, thermostatic medium comprising liquid product characterized by remaining stable over range of from 0° F. to 800° F. and being noncorrosive to stainless steel, iron, copper or brass, consisting of mixture of tetraphenoxysilane and phenol silicate. No. 2,413,513. Vaughan Morrill, Jr. to American Stove Co.

Preparing 3,3'-dichloroindanthrone by direct chlorination of indanthrone wherein some mono-chlorinated material is to be separated from dichloroindanthrone but wherein no trichloroindanthrone is present. No. 2,413,514. Melvin Perkins and Paul Johnson to E. I. du Pont de Nemours & Co.

Preparing zinc salts of aromatic mercaptans of benzene and naphthalene series comprises reacting mercaptan, which carries no other functional group, with zinc oxide in inert organic reaction medium 10° to 250° C. No. 2,413,531. John Verbane to E. I. du Pont de Nemours & Co.

Making alkyl silicon derivative in which alkyl group contains from one to eight carbon atoms comprising reacting silicon tetrahalide selected from chloride, bromide and iodide with alkyl halide selected from chloride, bromide and iodide, in which alkyl group contains from one to eight carbon atoms, concurrently in presence of metallic lithium. No. 2,413,582. John Rust and Charles MacKenzie, one-half to Montclair Research Corp., and one-half to Ellis-Foster Co.

Production of 3,5-dimethyl aniline and symmetrical collidine from isophorone. No. 2,413,598. Seaver Ballard and De Loss Winkler to Shell Development Co.

Production of vinyl cyanide comprises reacting hydrocyanic acid with acetylene in vapor phase at 350 to 700° C. in presence of alkali metal cyanide catalyst. No. 2,413,623. Charles Harris to E. I. du Pont de Nemours & Co.

Parasiticidal composition containing sole fungicidal and insecticidal agent copper salt of N-acylated amino acid selected from meta-aminobenzoic acid and para-amino-benzoic acid and carrier therefor. No. 2,413,627. William Hester and W. E. Craig to Rohm & Haas Co.

New composition of matter comprising product of reaction of sulfhydrated terpene with sulfide of phosphorus. No. 2,413,648. Emil Ott to Hercules Powder Co.

Purifying styrene contained in mixture with xylenes including ortho xylene. No. 2,413,674. Horace Weir to The United Gas Improvement Co.

Production of neohexane involving catalytic isomerization. No. 2,413,691. Chester Crawford, William Ross and Sumner McAllister to Shell Development Co.

Composition $C_4H_5ClF_6$ having boiling point 35-36° C. and vapor density of 5.272 g. per liter at 24° C. and 480 mm. Heating CF_3CH_2Cl at 615 C. and isolating fluoro organic compounds. No. 2,413,695. Frederick Downing, Anthony Benning and Robert McHarness to Kinetic Chemicals, Inc.

Compound $C_2F_6H_2$ which has boiling point of 10-11° C. and vapor density of 6.97 g/liter at 21° C. and 760 mm. No. 2,413,696. Frederick Downing and Anthony Benning and Robert McHarness to Kinetic Chemicals, Inc.

Terpene product and preparation. No. 2,413,719. Donald Lister to Hercules Powder Co.

Preparing polyhydroxy terpene product, containing at least three hydroxyl groups, comprises reacting unsaturated monocyclic terpene hydrocarbon in liquid phase with water and free oxygen, as sources of oxygen at temperature of 30° C. to 80° C. for 5 hours to 40 days. No. 2,413,720. Donald Lister to Hercules Powder Co.

Preparation of condensation products, comprises reacting ammeline with compound containing alkylene oxide ring. No. 2,413,755. Walter Ericks to American Cyanamid Co.

Producing acrylic nitrile by dehydration of ethylene cyanohydrin, comprises heating ethylene cyanohydrin in presence of catalyst of acid-activated smectite clay from bentonite and montmorillonite clays. No. 2,413,773. Hoke Miller to Air Reduction Co., Inc.

Converting ethyl ether to ethyl alcohol, comprises passing mixture of ether and water vapors over heated catalyst consisting of acid treated clay of smectite type. No. 2,413,802. Richard Tollefson to Air Reduction Co., Inc.

2-Ethyl-2-butyl propanediol-1,3. No. 2,413,803. Samuel Tribit to U. S. Industrial Chemicals, Inc.

Compositions containing esterified acidic sulfopolycarboxy acid fractional ester of oxyalkylated alcoholiform polyhydroxy body, having at least 3 alcoholiform hydroxyl groups and not more than 10 carbon atoms, esterification involving carbon-linked hydroxyl groups of organic hydroxylated bodies. No. 2,413,814. Melvin De Groote and Bernhard Keiser to Petrolite Corp., Ltd.

Production of keto ethers. No. 2,413,822. Bradford Geyer and Seaver Ballard to Shell Development Co.

Substituted 4,4'-diaminodiphenyl sulfones and process of making. No. 2,413,833. Lucas Kyrides to Monsanto Chemical Co.

Substituted 4,4'-diaminodiphenyl sulfones and process of making. No. 2,413,834. Lucas Kyrides to Monsanto Chemical Co.

Substituted 4,4'-diaminodiphenyl sulfones and process of making. No. 2,413,835. Lucas Kyrides to Monsanto Chemical Co.

Preparing dry acrylic acid comprising mixing and heating ester of acrylic acid with saturated aliphatic acid under anhydrous conditions in presence of mineral acid esterification catalyst and polymerization inhibitor, removing by-product ester as formed. No. 2,413,889. Chessie Rehberg and Charles Fisher to Secretary of Agriculture of the United States of America.

Beta-arylmercapto propionitrile. No. 2,413,917. Marion Harman to Monsanto Chemical Co.

Obtaining N-alkylglycine, comprises heating together formaldehyde, carbon monoxide and amine. No. 2,413,968. Alban Hallowell to E. I. du Pont de Nemours & Co.

Additional patents from the above volumes will be given next month.

Trademarks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

426,208. Murray L. Schuster, as United Sanitary Chemicals Co., Baltimore, Md.; filed June 15, 1945; Serial No. 484,596; for cleaning and polishing porcelain; since Jan. 5, 1944.

426,481. Owens-Corning Fiberglas Corp., Toledo, Ohio; filed July 24, 1944; Serial No. 472,580; for filter cloths containing glass fibers; since Jan. 17, 1936.

426,609. John W. Hillegas, as Red's Model Shop, Cleveland, Ohio; filed June 19, 1946; Serial No. 504,181; for cement or adhesive; since Dec. 1, 1938.

426,756. The Munising Paper Co., Munising, Mich., and Chicago, Ill.; filed Sept. 25, 1945; Serial No. 488,916; for chemically treated dusting and polishing sheets; since Aug. 31, 1945.

467,508. The American Products Co., as Zanol Products Co., Cincinnati, Ohio; filed Feb. 18, 1944; for water softener, laundry, starch, ironing tablets, drain pipe opener; since Sept. 1, 1915.

468,727. Phillips Petroleum Co., Bartlesville, Okla.; filed Mar. 27, 1944; for furniture polish, auto polish, liquid and paste auto wax; since October 1931.

470,428. Tokheim Oil Tank & Pump Co., Fort Wayne, Ind.; filed May 19, 1944; for oil, liquid, and fuel measuring and dispensing pumps; since May 1902.

481,257. The American Products Co., as Zanol Products Co., Cincinnati, Ohio; filed Mar. 17, 1945; for cleaning, scouring and polishing; since Sept. 1, 1945.

483,119. Siebe, Gorman & Co., Ltd., Tolworth, Surrey, England; filed May 8, 1945; for cylinders and capsules for compressed gas; since Jan. 9, 1930.

486,090. Enoz Chemical Co., Chicago, Ill.; filed July 21, 1945; for insecticide; since Nov. 30, 1934.

487,792. Nash Engineering Co., South Norwalk, Conn.; filed Aug. 30, 1945; for pumps and parts thereof; since June 1919.

489,772. The Special Chemicals Co., Cleveland, Ohio; filed Oct. 10, 1945; for bulk commercial synthetic resins; since Mar. 15, 1945.

490,322. W. B. McVicker & Co., Inc., Brooklyn, N. Y.; filed Oct. 22, 1945; for preparation having properties for destroying bacteria; since Oct. 1, 1945.

492,257. Chemical Products Co., Omaha, Nebr.; filed Nov. 27, 1945; for all purpose cleaner; since Aug. 1, 1937.

492,827. Ellis Paint Co., Long Beach, Calif.; filed Dec. 7, 1945; for full gloss enamel; since May 1, 1940.

492,854. The Plastic-Ply Corp., Cleveland, Ohio; filed Dec. 7, 1945; for polish for metals; since July 1, 1945.

494,709. Scientific Anglers, Midland, Mich.; filed Jan. 12, 1946; for waterproofing composition for treating leather; since Oct. 3, 1945.

495,016. The Diversey Corp., Chicago, Ill.; filed Jan. 19, 1946; for general cleaning compound; since Dec. 29, 1945.

495,564. American Sponge & Chamois Co., Inc., New York, N. Y.; filed Jan. 29, 1946; for cellulose sponges; since Dec. 31, 1941.

495,606. The International Nickel Co., Inc., New York, N. Y.; filed Jan. 29, 1946; for welding rods; since Jan. 2, 1946.

495,668. Hardesty Chemical Co., New York, N. Y.; filed Jan. 30, 1946; for synthetic detergent in liquid, paste, or powder form; since Jan. 8, 1946.

496,651. National Oil Products Co., Harrison, N. J.; filed Feb. 15, 1946; for blend of fatty oils for oiling-off and fat-liquoring of leather; since Nov. 23, 1945.

496,701. Edwin W. Heath, III, as Heath Products Co., Bristol, Pa.; filed Feb. 16, 1946; for insecticides; since Jan. 7, 1946.

497,268. Quaker Chemical Products Corp., Conshohocken, Pa.; filed Feb. 26, 1946; for detergents; since Feb. 11, 1946.

497,310. Francis H. Hoge, Jr., as The U. N. Products Co., New York, N. Y.; filed Feb. 27, 1946; for insecticides; since Nov. 10, 1945.

497,336. Rockwell Manufacturing Co., Homewood, Pittsburgh, Pa.; filed Feb. 27, 1946; for valve lubricating greases; since Dec. 13, 1945.

497,497. Quaker Chemical Products Corp., Conshohocken, Pa.; filed Mar. 1, 1946; for detergents; since Jan. 21, 1946.

498,475. G. H. Wood & Co., Ltd., Toronto, Ontario, Canada; filed Mar. 18, 1946; for cleaning and waxing preparation; since Sept. 24, 1945.

499,089. United Chromium, Inc., New York, N. Y.; filed Mar. 27, 1946; for cleaning metals preparatory to electroplating; since Sept. 24, 1943.

499,423. The McKay Co., Pittsburgh, Pa.; filed Apr. 1, 1946; for welding electrodes; since April 1944.

499,797. Pacific Allied Products, Seattle, Wash.; filed Apr. 6, 1946; for cleaner of painted surfaces; since Mar. 15, 1946.

500,824. Rayonier Inc., New York, N. Y.; filed Apr. 24, 1946; for wood cellulose in sheet form; since Nov. 30, 1945.

500,922. American Cyanamid & Chemical Corp., New York, N. Y.; filed Apr. 26, 1946; for insecticide, rodenticide, weed killer; since Nov. 18, 1945.

501,199. The Pynol Co., Quincy, Ill.; filed Apr. 30, 1946; for liquid pine oil disinfectant; since Apr. 23, 1934.

501,323. Herbert J. Heribert, New York, N. Y.; filed May 2, 1946; for coating, finish or lacquer for textiles and plastics; since Apr. 30, 1946.

501,659. Geigy Co., Inc., New York, N. Y.; filed May 8, 1946; for application of dyes and dyestuffs; since Nov. 9, 1936.

501,661. Geigy Co., Inc., New York, N. Y.; filed May 8, 1946; for application of dyes; since June 23, 1937.

501,673. Magitex Co., Inc., Saco, Maine; filed May 8, 1946; for insecticides; since January 1946.

501,708. Bachmeier & Co., Inc., New York, N. Y.; filed May 9, 1946; for dyes; since Apr. 1, 1916.

503,600. Rock-Tred Corp., Chicago, Ill.; filed June 10, 1946; for cementitious surfacing and patching material; since Feb. 8, 1946.

505,333. Carolina Industrial Plastics Corp., Mount Airy, N. C.; filed July 10, 1946; for plastic coated cordage; since Apr. 12, 1946.

506,553. Wootson L. Sanderson, Meridian, Miss.; filed July 30, 1946; for artificial stone and brick; since Jan. 1, 1920.

506,653. John J. Draine, as Laundex Chemical Products Co., New York, N. Y.; filed Aug. 1, 1946; for cleaning metal plate surfaces; since 1929.

509,647. Filtration Engineers, Inc., New York, N. Y.; filed Sept. 24, 1946; for filters, chemical driers, filter-cake compressors, drying systems; since Aug. 1, 1919.

509,771. The Goodyear Tire & Rubber Co., Akron, Ohio; filed Sept. 26, 1946; for adhesive cement; since May 18, 1946.

Trademarks reproduced and described include those appearing in Official Gazette of U. S. Patent Office, December 17—January 7.

SPOT-BRITE 426,208

JIFFY 481,257

PLASTIPLATE 492,854

"FAL-CONET" 496,701

PLURALLOY 499,423

Fleesit 501,673

FIBERGLAS 426,481

HY-DRY 494,709

Fundaclean 499,797

BACO 501,708

OXYLET 483,119

EXPERT 426,609

DIVOSAN 495,016

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ENOZONE 486,090

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RAYAMO 500,824

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Philips 66 468,727

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ONCE A PIONEER ALWAYS A PIONEER 501,323

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MASTAX 498,475

IRGALEVONE 501,659

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C_2H_5
C_2H_5 > O.BF_3

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Boiling Point: 125°C
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%BF_3: 47.8% min.

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